Networked PRINTERS

UNIXWORLD

McGRAW-HILL'S MAGAZINE OF OPEN SYSTEMS COMPUTING

JUNE 1991

Joining PCs and UNIX

Effective ways to unite DOS & UNIX users

New DEC workstations feature plug-in CPUs

REVIEWS

- SPARCstation 2 — better OS, higher price
- Speed up your DBMS with Canonizer
- Avalon — low-priced desktop publisher

INTERVIEW

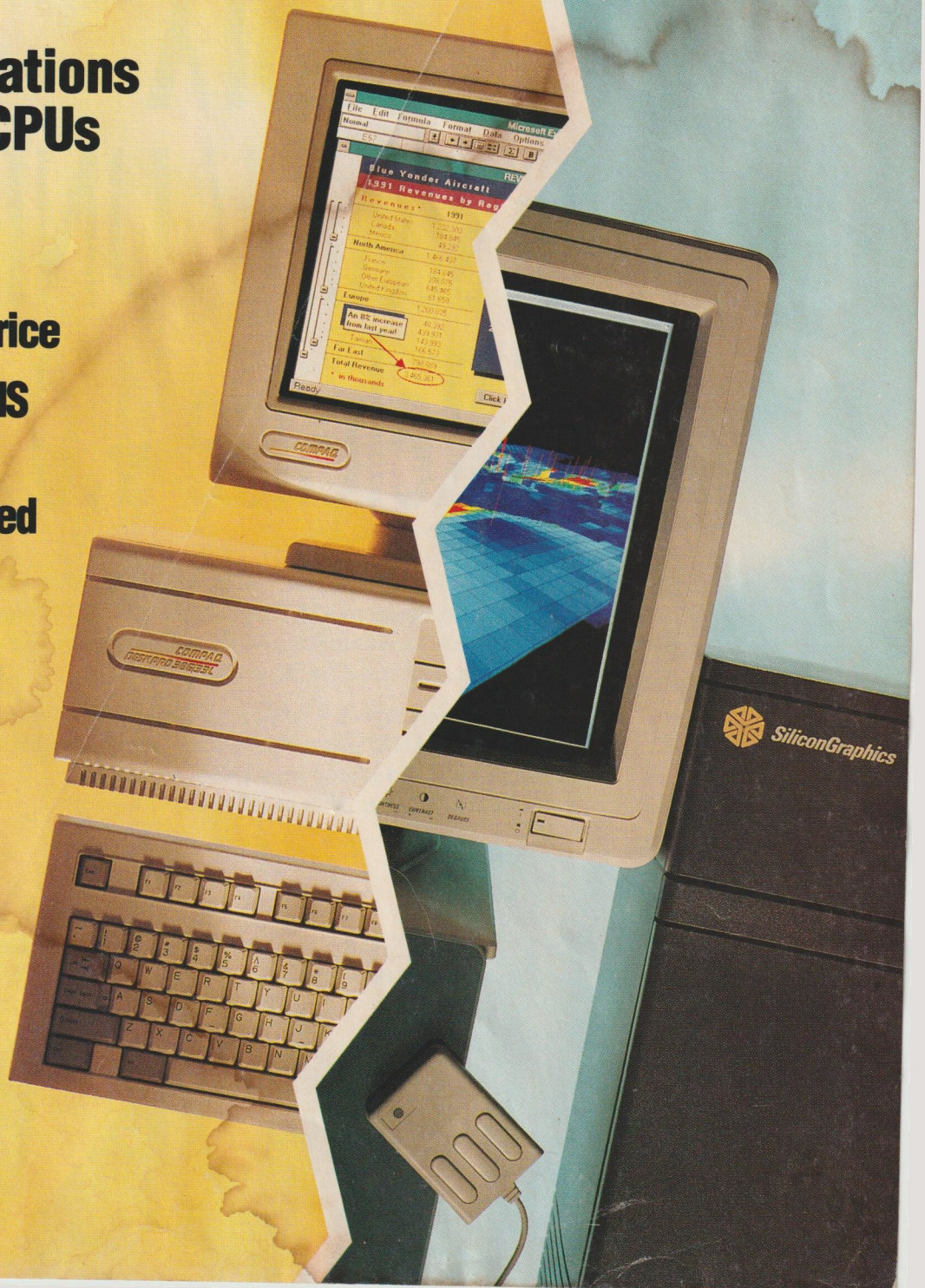
Europe's most powerful Open Systems user

TIPS

File and record locking

STRATEGIES

Novell's Portable NetWare



$3 USA £1.95 UK

06

08867

0 537335 2

ANNOUNCING

ESIX System V UNIX® Release 4.0

Finally, ESIX System V Release 4.0, the UNIX Operating System of choice is here. Based on AT&T® System V UNIX®, ESIX Release 4.0 is a stable, fully backward compatible and robust operating system with enhanced features and functionalities.

For all the current System V Release 3.2 owners, ESIX offers an easy upgrade path to ESIX Release 4.0. For more information about ESIX System V Release 4.0 product offerings, please call:
1(800) 821-0806 Ext: 2068 or (415) 683-2068

Fax: (415) 651-0728
48431 Milmont Dr.
Fremont, CA 94538, USA

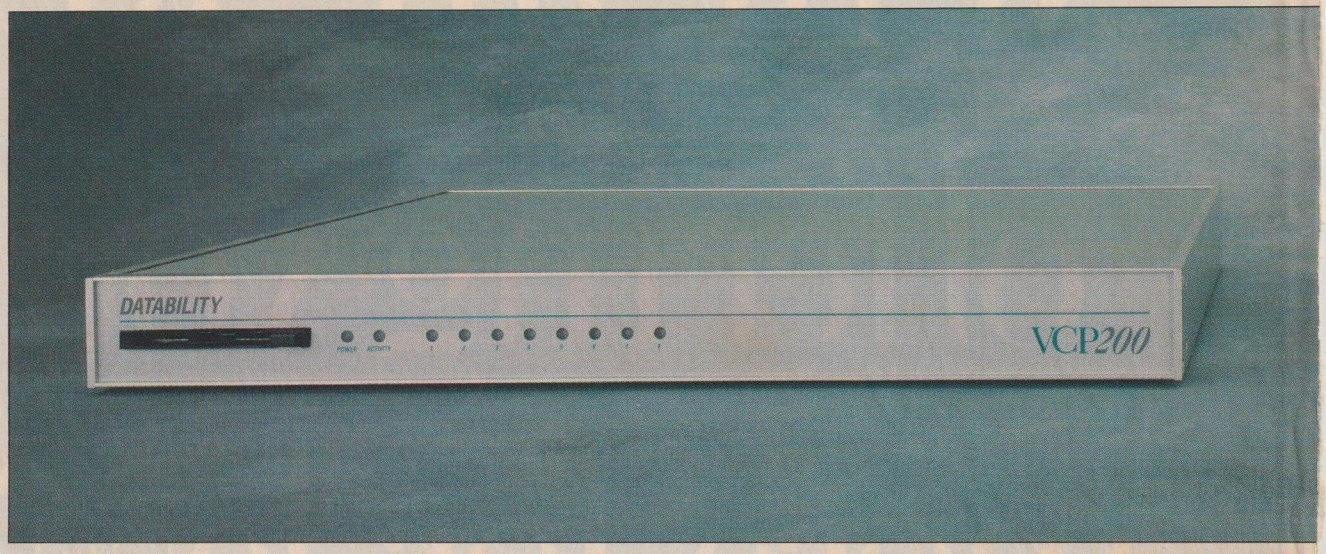
ESIX Computer, Inc is a subsidiary of Everex Systems, Inc.
All other company names and products are trademarks or registered trademarks of their respective companies.

ESIX SYSTEM V

CIRCLE NO. 124 ON INQUIRY CARD

Why are we offering you more for less?

Because



$1499*

VCP200 8-ports

What "more" looks like:

Single & Dual Protocol Units
"ROM" based 100% LAT and TCP/IP TELNET, RLOGIN and SLIP support.

Highest Performance
All ports can operate at 38.4kb simultaneously.

No End-User Retraining
100% DEC compatible command interface.

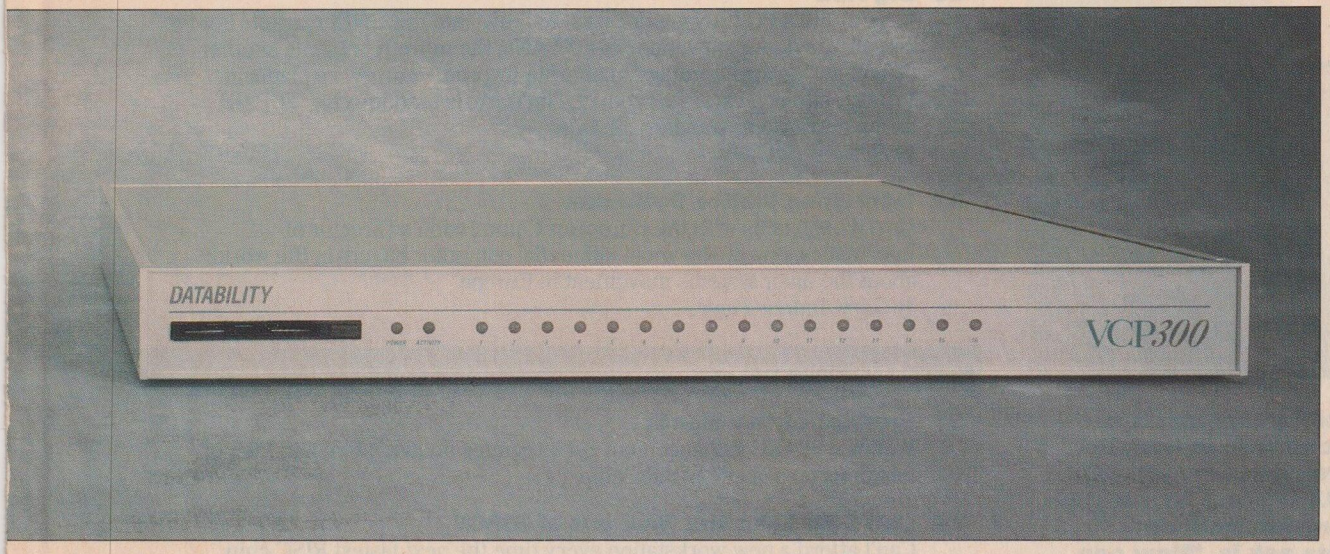
No Wiring Hassles
Supports standard and thin wire Ethernet, 8 or 16 RS232 and RS423 connections with modem controls.

Full Management Capability
100% DEC NCP/TSM compatible, full SNMP support and host based software download support.

State-of-the-Art "ROM" Card Technology
Installs in seconds. A single ROM card can operate a network of units.

Advanced Technology
Multi-Processor design and gate-array logic assure highest performance and reliability.

we can.



$1999*

VCP300 16-ports

How to get even "more" for less:

If we've got your interest but you want to see more, then take us up on our challenge. Try a VCP200 or 300 before June 30th, 1991, and if you buy it, we'll give you a special discount on other Databability products. Act now because until June 30th, more costs less than ever.

For more information call 1-800 DIAL DSS.
In NY: 212-807-7800. Fax: 212-463-0459.

DATABILITY
THE POWER TO CHANGE℠

Datability, Inc. 322 Eighth Avenue, New York, NY 10001
Atlanta Boston Chicago San Francisco London

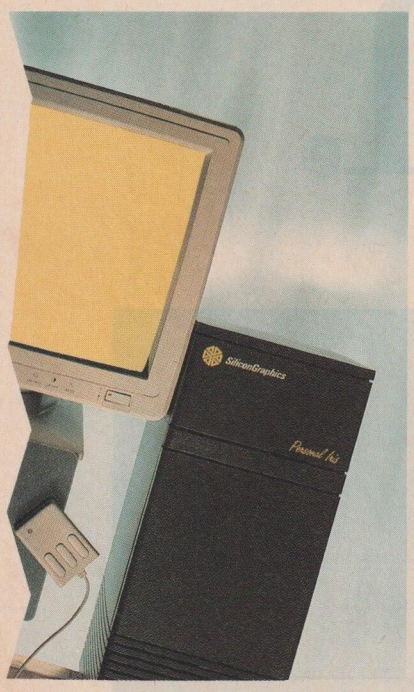
* Special introductory price on single protocol servers good until June 30th, 1991.
Dual protocol servers slightly higher.

© 1991 Datability, Inc. All product names are registered trademarks of their respective manufacturers.

CIRCLE NO. 106 ON INQUIRY CARD

UNIXWORLD

McGRAW-HILL'S MAGAZINE OF OPEN SYSTEMS COMPUTING



Some might consider it a mismatch made in Hell, but there are ways to unite DOS and UNIX users. The question that many information managers ask is, "How can we make effective use of the information on both systems?" To find out, see page 58.

Cover photographs by Michael Carr; PC courtesy Compaq Computer Corp., workstation courtesy Silicon Graphics Inc.

FEATURES

Cover Story

58 The DOS-to-UNIX Connection
You've got UNIX machines and you've got PCs. Should you connect them to share information? We tell you why and suggest ways to link the two systems to get work out of both
by Frank Hayes

Strategies

69 Big Red
Why would a PC LAN vendor want to move into the UNIX market? For Novell, the dominant vendor of PC LANs, the move represents another step in its "neutral" strategy of offering its product on every platform. Why should you care? Its product, NetWare, is far outpacing TCP/IP as the networking standard for PCs
by Howard Baldwin

83 Interview: Walter DeBacker
UNIXWORLD talks with the European Commission's Director of Informatics, one of the most influential computer buyers in the world, about the open systems movement in Europe
by Gary Andrew Poole

WHAT'S NEW

31 Product of the Month
Weitek's SPARC Enhancement Kit integrates floating-point and integer functions on a single SPARC chip

77 Can DEC Take the Risk out of RISC?
Can't afford a new workstation every time the next fastest RISC chip comes out? Digital Equipment Corp.'s strategy puts the CPU on a daughterboard that can be lifted out and upgraded
by Howard Baldwin

Point of Purchase

93 Should Your Printer Be a Network Sprinter?
Today's business environment requires special features for networked printers. It's more than dots per inch and pages per minute–you need network capabilities that support multiple systems and multiple users
by Howard Baldwin

153 New Products
Software development across platforms and networks

UNIXWORLD (ISSN 0739-5922/90) is published monthly for $18 per year by McGraw-Hill, Inc., 444 Castro St., Mountain View, CA 94041; 415-940-1500. Second-class postage paid at Mountain View, CA and additional mailing offices. Postmaster, send Form 3579 to UNIXWORLD, P.O. Box 571, Hightstown, NJ 08520. Subscriptions cost $18 for one year within the U.S.A. and its possessions. For Canadian subscriptions, add $6 for each year. For foreign subscriptions, add $20 each year for surface mail. Remit in U.S. funds. Subscription questions and problems: Contact UNIXWORLD Subscription Department, P.O. Box 571, Hightstown, NJ 08520; 800-525-5003 for U.S. calls only, foreign calls: 609-426-7070. Printed in United States of America.

Entire contents copyright; © 1991 by McGraw-Hill, Inc., unless otherwise noted. All rights reserved. **UNIX is a registered trademark of UNIX System Laboratories, Inc. UNIXWORLD is not affiliated with AT&T.** Statements of fact and opinion are made on the responsibility of the authors alone and do not imply an opinion on the part of McGraw-Hill, Inc., or the editorial staff of UNIXWORLD.

The Audit Bureau

June 1991 • Volume VIII, Number 6 • A McGraw-Hill Publication

REVIEWS

98 Sun's Upscale SPARC 2
Facing stiff competition from such hot boxes as IBM's RS/6000 and HP Apollo's Series 700, Sun's SPARCstation 2 provides a much-needed boost to the SPARCstation line
by Cimarron Boozer

107 Designing a Faster, More Efficient Database
The words downsizing and reorganization don't usually come to mind when talking about databases, but Six Sigma Case's Canonizer helps you build a leaner, cleaner database
by Rick Farris

111 Low-cost Publishing for the Masses
Elan's Avalon Publisher is an inexpensive, easy-to-use desktop publishing system for simple publishing tasks
by Keith Edwards

HANDS-ON HELP

121 New Ways to Lock Files and Records
Yes, techniques within UNIX can ensure data integrity in a multiuser environment
by W. Richard Stevens

135 Wizard's Grabbag
Word spell, shell string routines, Bourne shell log

143 Answers to UNIX
Starting scripts, adding returns, shell debugging

VIEWPOINTS

11 Editor's Thoughts
Aliens forced me to buy Windows

45 The Serlin Report
What's Oracle doing with massively parallel computing?

DEPARTMENTS

15 Industry News
ACE in the hole for MIPS?

25 Mail

39 Library
Books for handling user interface screens

51 Profile
Bud Huber: This Bud's for users

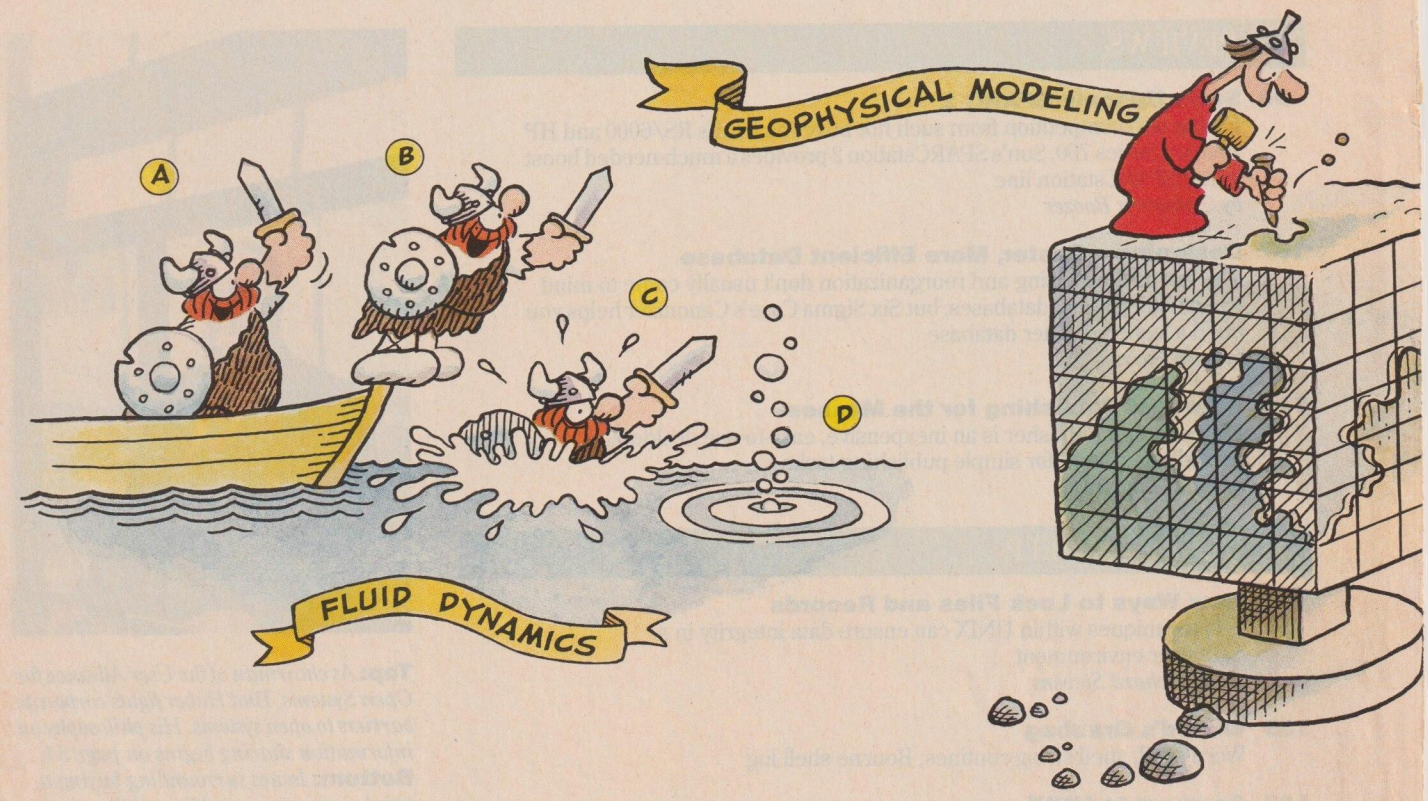
111 Standards
Who's in charge of international standards?

150 Advertisers' Index

151 Calendar

Top: *As chairman of the User Alliance for Open Systems, Bud Huber fights corporate barriers to open systems. His philosophy on information sharing begins on page 51.*
Bottom: *Issues surrounding buying a printer are more complicated than just resolution and speed. For a rundown on other considerations for today's multiuser environments, see page 93.*

The IBM RISC System/ The power you've been seeking



It's a never-ending quest for power seekers. You're always looking for ways to run your favorite applications faster. Well, search no more. The RISC System/6000™ family of POWERstations and POWERservers gives you power that soars as high as 23 MFLOPS.

	MFLOPS	MIPS	SPECmark™
POWERstation 320	8.5	29.5	24.6
DECstation 5000-200	3.7	24.2	18.5

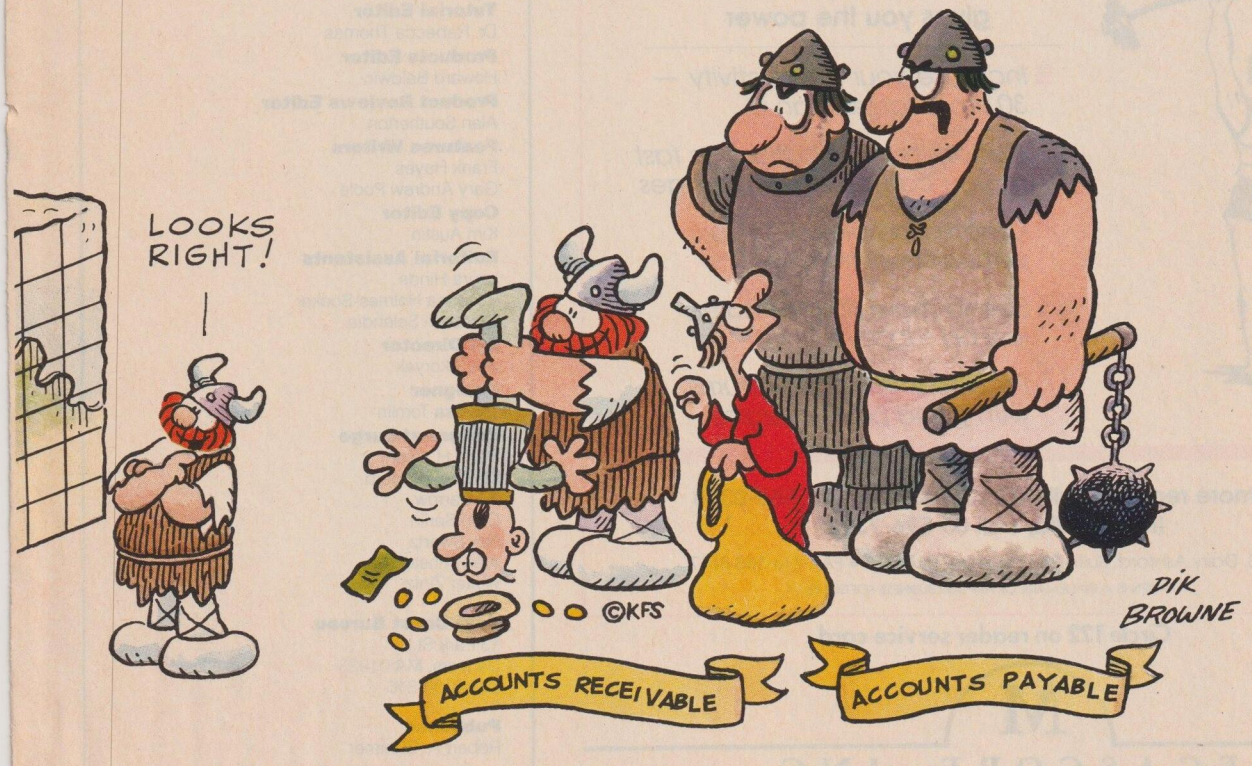
When it comes to porting, your ship has come in. Of course, all the speed in the world wouldn't mean much without the applications you need. So the RISC System/6000 family already has more than 2,500 of the most popular technical and commercial applications up, running and running fast. And if you think you know a good thing when you see it, so do software vendors. That's why you'll also be seeing more and more applications coming on board the RISC System/6000 platform all the time. And if you like to build your own solutions, there's a full arsenal of enablers and relational data bases from leading vendors, as well as CASE tools and a host of popular programming languages.

A smorgasbord of solutions. Applications already announced include the IBM engineering design packages CADAM™, CAEDS™, CBDS™,

MFLOPS are the results of the double-precision, all FORTRAN Linpack test 100x100 array suite. The Dhrystone Version 1.1 test results are used to compute RISC System/6000 Integer MIPS value where 1,757 Dhrystones/second is 1 MIPS (Vax 11/780). SPECmark is a geometric mean of ten benchmark tests. All performance data are based on published benchmark information.

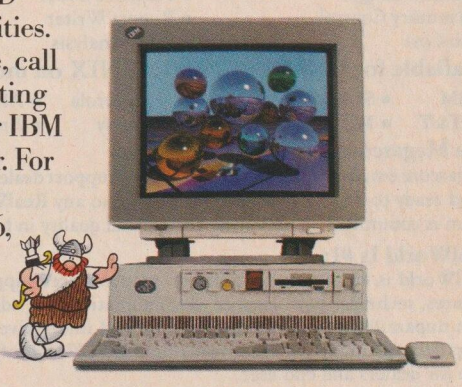
IBM is a registered trademark, and RISC System/6000 and CAEDS are trademarks of International Business Machines Corporation. SPECmark is a trademark of Standard Performance Evaluation Corporation. UNIX is a registered trademark of UNIX System Laboratories, Inc. CADAM is a trademark of CADAM INC. CATIA is a trademark of Dassault Systemes. CBDS is a trademark of Bell Northern Research Corporation. DECstation is a trademark of Digital Equipment Corporation. HAGAR THE HORRIBLE Character(s) © 1990 King Features Syndicate, Inc. © IBM Corp. 1991, all rights reserved.

6000 family. for all your applications.



CATIA™ and AES. Also available are a broad spectrum of solutions from vendors like Valid Logic, MacNeal Schwendler, Swanson Analysis, SAS Institute, SPSS, Wavefront, Alias, Polygen, Cadence, Fluid Dynamics International, Western Atlas, ECL Petro and creare.X. Scientific and technical applications are available in areas like physics, structural analysis, chemistry, securities trading, mathematics, earth resources, operations research, visualization, graphics, technical publishing and more. There's also accounting software like FourGen and support for leading UNIX®-based office automation packages. And there are key industry applications for businesses in medical groups, retail stores, newspapers, pharmacies and many more.

Command enormous processing clout.
The RISC System/6000 family is built to boost the performance of the software power seekers use most. It's got the best floating point processor in the business for numerically intensive applications, plus a new superscalar processor and incredible 3D graphics capabilities. To find out more, call your IBM marketing representative or IBM Business Partner. For literature, call 1 800 IBM-6676, ext. 990.



For the Power Seeker.

IBM®

APPGEN™

4GL & BUSINESS APPLICATIONS

Why You Need APPGEN
REASON #4: POWER

APPGEN'S 4GL environment gives you the power

- *Increase your productivity — 30 times faster than C*
- *Customize applications as fast as you can describe changes*
- *Create complex systems with minimal training*
- *Spend more time on sales, less on support*
- *Provide immediate returns with good profit margins*

For more reasons call 800-231-0062 or 713-558-0338
In Australia, call 03-596-7322

2000 S. Dairy Ashford, Suite 285 Houston, TX 77077 • FAX 713-558-8617

APPGEN IS A TRADEMARK OF APPGEN BUSINESS SOFTWARE

Circle 122 on reader service card

M

MEGASCORE, INC.

AND RealWorld
THE SMART CHOICE IN ACCOUNTING SOFTWARE

Come to the people RealWorld chose to port their own source code to the XENIX operating system . . . MEGASCORE. Established in 1978.

Version 5.0 Now Available - All versions supported

Over 200,000 Satisfied End Users And Dealers In:

- Accounts Receivable
- Accounts Payable
- General Ledger
- Inventory Control
- Job Cost
- Order Entry/Billing
- Payroll
- Purchase Order
- Report Writer
- Sales Analysis
- Point of Sale
- Retail Inventory Control (with Serial Inventory
- Extended Features
- Order Entry Plus

Available for UNIX, AIX and XENIX on most popular platforms including:

- IBM
- SUN
- NCR
- Motorola
- Altos
- Kowin
- Compatibles
- AT&T
- MIPS
- UNISYS
- Tandy
- Arete
- Cromenco
- And Others

The Megascore Experts:

Megascore employs a highly trained staff to support dealers as well as end users. Our professionals stand ready to answer questions pertaining to any RealWorld or UNIX system. The Megascore Team is committed to providing service and quality in business software.

RealWorld Is #1:

RealWorld is #1 in user friendliness, manufacturer support, demonstratability, dealer margins, features, technical performance, documentation and adaptability. Megascore backs RealWorld with unparalleled support, self running and interactive demos and excellent reseller margins. Megascore also supports older versions of RealWorld software as well as modifies the RealWorld code for dealers and end user.

CALL ONE OF OUR SALES REPRESENTATIVES TODAY.

Dealer Inquiries Welcomed. **1-800-356-8560**

XENIX is a trademark of Microsoft Corporation • UNIX is a trademark of AT&T Bell Labs • Registered trademark RealWorld Corp. • AIX is a trademark of IBM

MEGASCORE, INC. THE ACCOUNTING SYSTEM PEOPLE

219 Paterson Avenue, Little Falls, NJ 07424 201-256-8560 / FAX: 201-256-7296

CIRCLE NO. 12 ON INQUIRY CARD

UNIXWORLD

Editor-in-Chief
David L. Flack
Executive Editor
Dianne M. Jacob
Managing Editor
Jon Feuerhelm
System Software & Tutorial Editor
Dr. Rebecca Thomas
Products Editor
Howard Baldwin
Product Reviews Editor
Alan Southerton
Features Writers
Frank Hayes
Gary Andrew Poole
Copy Editor
Kim Austin
Editorial Assistants
Laura Hinds
Rosanna Holmes-Booker
Elizabeth Selandia
Art Director
Joe Sikoryak
Designer
Theresa Tomlin
Editors-at-Large
Harry H. Avant
Michael Burgard
Rik Farrow
Omri Serlin
Ray Swartz
Alan Winston
Walter Zintz

East Coast Bureau
13 Park St.
Danvers, MA 01923
508-970-6816

Publisher
Robert A. Billhimer

Business Manager
Robert F. Mulvey

Production Manager
Diane B. Freeman
Senior Production Artist
Michael De Leon
Production Artist
Lupe Lopez

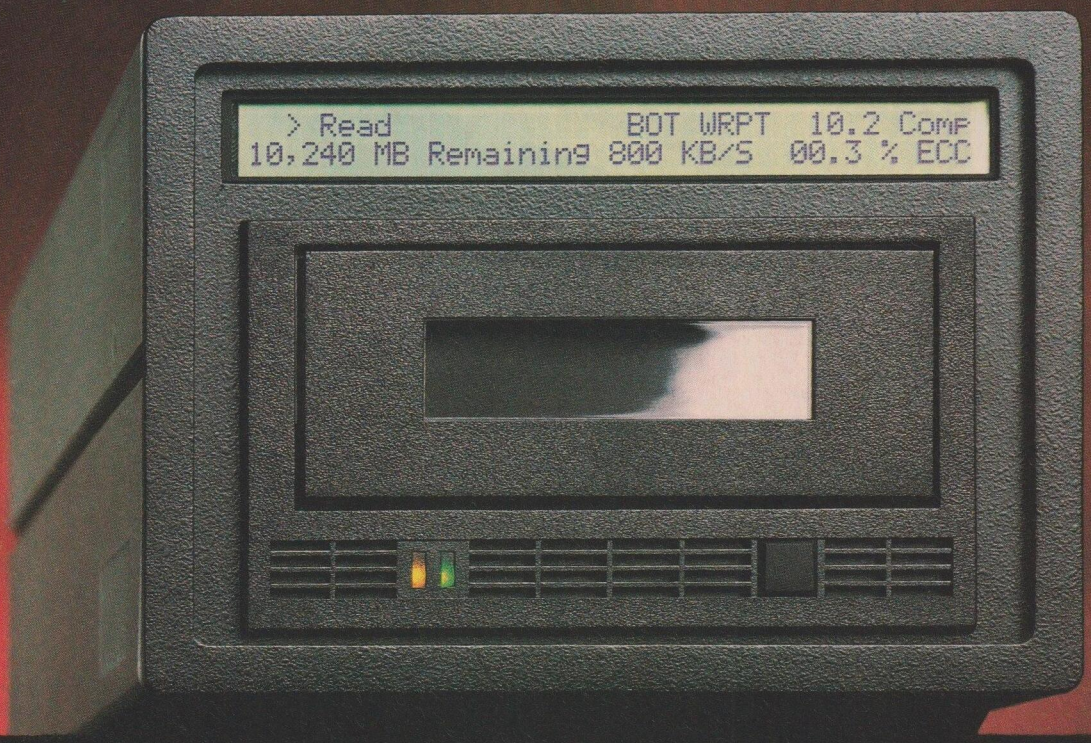
Circulation Manager
Verlene J. Perry
Circulation Assistant
Sheri L. Miller

Subscriber Services:
For information or assistance with your subscription, please contact a Subscriber Service Representative at 1-800-525-5003.
Foreign Subscribers:
Please call 609-426-7070
Editorial Reprints:
Custom printed reprints of articles in UNIXWORLD are available at reasonable prices. Minimum 500.

UNIXWORLD
444 Castro St.
Mountain View, CA 94041
415-940-1500, FAX: 415-967-1257
UUCP: uunet!uworld!letters
letters@uworld.com

Officers of McGraw-Hill, Inc.: Joseph L. Dionne, chairman, president, and chief executive officer; Robert N. Landes, executive vice president, general counsel, and secretary; Walter D. Serwatka, executive vice president; Frank D. Penglase, senior vice president, Treasury Operations.

NOW THAT 10GB FITS ON AN 8MM TAPE, WHAT ARE YOU WAITING FOR?



You don't need to wait hours to change tapes.

You don't need to wait months for other storage technologies to catch up.

One 8mm tape drive will already deliver more than they promise.

It's the digital CY-8200, now with optional data compression. And you can get it exclusively from Contemporary Cybernetics Group.

With data compression, the CY-8200 can quadruple the amount of data you can load on an 8mm cassette that fits neatly in your shirt pocket. Meaning the already tremendous savings in man hours, media costs, storage and shipping are multiplied by four.

Until now, the best 8mm drive on the market stored an impressive 2.5 GB per tape at speeds up to 15 MB per minute.

True "Plug-And-Play" Compatibility With:

Alliant	DEC 3100	IBM S/36	Pertec
Alpha Micro	DEC HSC	IBM AS/400	Plexus
Altos	DEC Q-Bus	Macintosh	Prime
Apollo	DEC TU/TA81	NCR	Pyramid
Arix	DEC Unibus	Novell	Sequent
AT&T	Gould	PC 386/ix	Sun
Convergent	HP	PC MS-DOS	Unisys
Data General	IBM RT	PC Xenix/Unix	Wang

and more...

Our data compression option allows you to write up to 10 GB per tape at up to 60 MB per minute. Completely unattended.

Of course, the data compression feature is switch-selectable, so you can turn off data compression to read and write standard 8mm tapes.

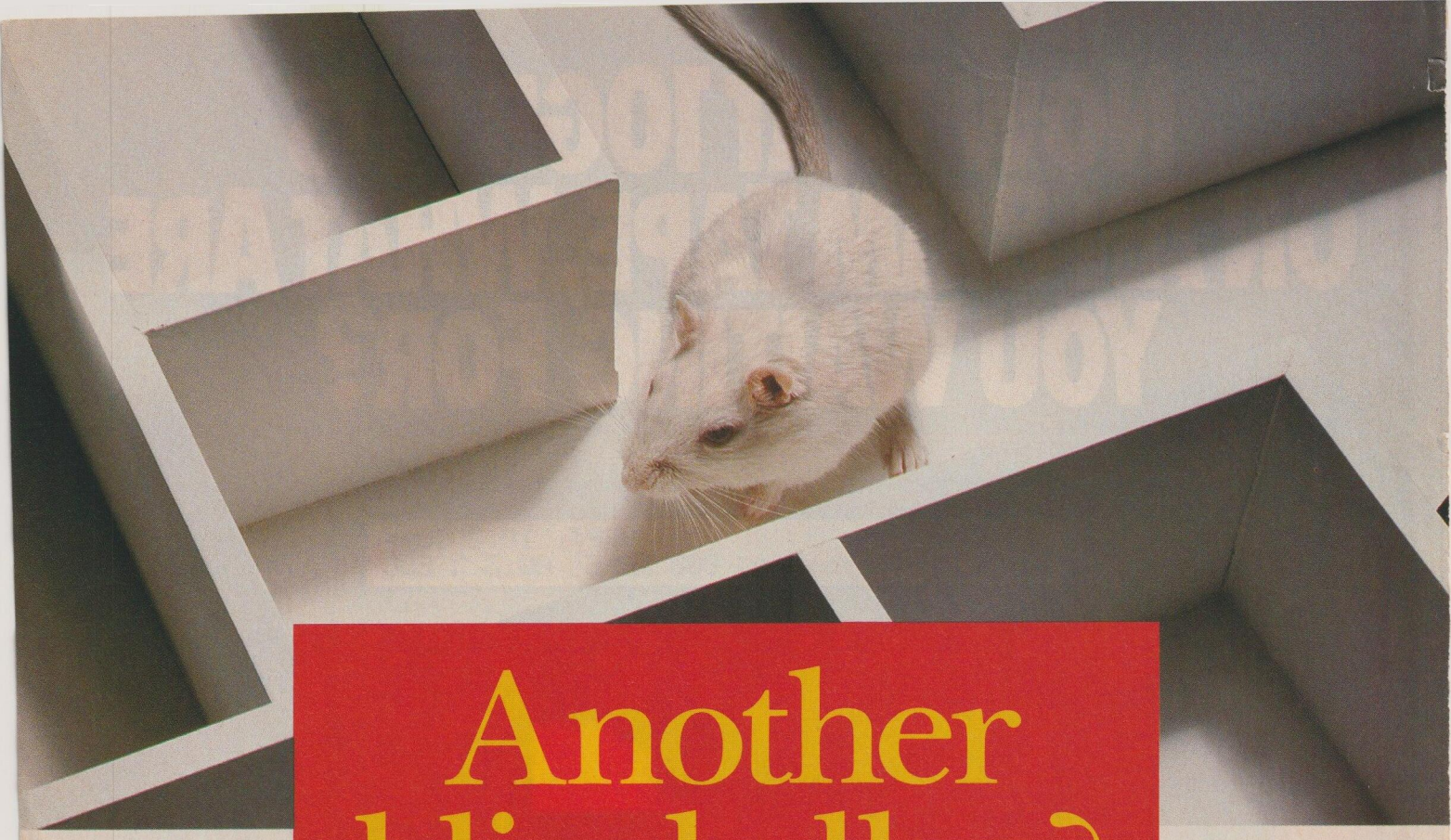
Plus it's a simple upgrade for the best tape drive built: our CY-8200. Offering a complete range of standard interfaces, a 2-line, 40-column display option, and optional security card encryption. And assuring you of full support and a 12-month warranty from the leader in advanced 8mm helical scan technology.

The CY-8200 with data compression will remain the best value in data storage for a long time to come. So now you've got many good reasons for calling us today at (804) 873-0900 and no good reason for waiting.

CONTEMPORARY
CYBERNETICS
Group

Rock Landing Corporate Center • 11846 Rock Landing • Newport News, Virginia 23606 • Phone (804) 873-0900 • FAX (804) 873-8836

CIRCLE NO. 134 ON INQUIRY CARD



Another blind alley?

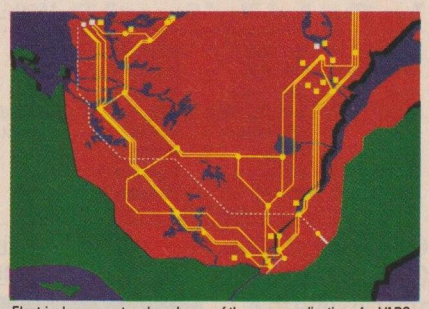
VAPS leads the way through your development maze.

Product and system development is a maze of design questions, trade-offs and tight deadlines. And when you get stuck, the clock doesn't stop ticking. Finding the right path quickly is key to solving the puzzle. VAPS gives you that key.

VAPS communicates your solutions and ideas quickly and effectively by using pictures – Pictures that Work and speak louder and much more clearly than lines of source code.

VAPS puts a face on your application.

Your customers and colleagues can better understand your ideas. And, you can better respond to their feedback with immediate, on-the-spot changes to zero in on the best solution.



Electrical power network, only one of the many applications for VAPS.

VAPS is flexible.

VAPS lets you explore every 'what-if' with lightning speed.

VAPS lets your end-users do things they couldn't do before.

VAPS animates your specific application, helps you explore interaction scenarios and build the human interface for your product.

VAPS supports you through every stage of product or system development – from rapid prototyping to simulation and software generation – saving you 90¢ on your dollar.

Virtual Prototypes has breakthrough technology.

Discover the wonder. Call (514) 483-4712 today to find the answer to your development puzzle.

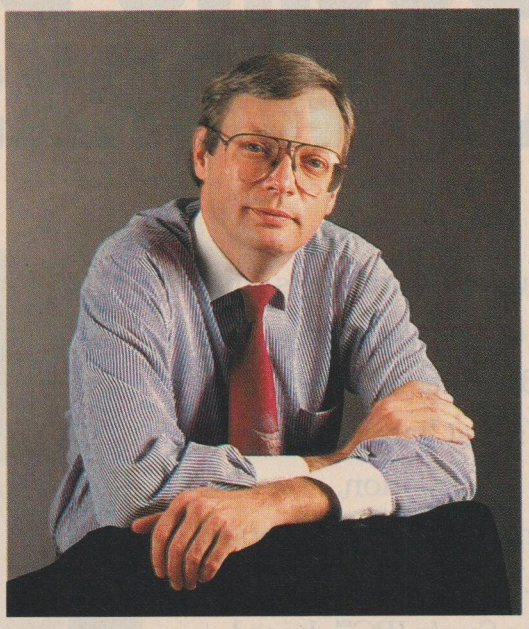
Virtual Prototypes

Pictures that Work.

Virtual Prototypes Inc.
5252 de Maisonneuve West, Suite 318
Montreal, Quebec, Canada H4A 3S5
Tel.: (514) 483-4712 – Fax: (514) 483-1231
Offices in Canada and the U.S.
Representation around the world.

VAPS is a registered trademark and Pictures that Work is a trademark pending of Virtual Prototypes, Inc. ©1991 – Virtual Prototypes, Inc.

CIRCLE NO. 216 ON INQUIRY CARD



ALIENS FORCED ME TO BUY WINDOWS

You're probably not going to believe this but...I was working at the office late one night, when I heard a strange noise. It was a crackling sound, like radio static. Suddenly, in the middle of editing a story, I was blinded by an intense light.

When I could see again I was looking at what had been my UNIX terminal. Instead of little orange letters on the screen there were windows with little pictures. Next to my keyboard was a pad and a mouse that moved the cursor like a magic wand. I thought to myself, "I'm actually working with a graphical interface. Aliens have transported me to GUIWorld."

Years ago I almost bought a Macintosh, but the little black-and-white screen and those hard-to-read characters were just too difficult to see. This was different. This screen was big and I could read the writing. The colors were bright and the windows on the screen were strangely inviting.

I began doing all those things I'd heard you could do with a GUI. I opened and resized windows. I popped up and pulled down menus. I took elevator rides on scroll bars. I even changed the colors and patterns on my desktop to my liking. So this was what I was missing on my dumb terminal.

Then I remembered I had work to finish. I quickly found the story I was working on, only to realize I would have to learn a new word processor. To my delight, there weren't a million commands to learn or menus to look through.

In no time my mouse was zipping over its pad like a skateboarder in a shopping mall parking lot. Click and drag. Highlight and move. I moved paragraphs around with ease using "cut and paste." I moved things from file to file and application to application. It would have taken hours just to figure out how to do this on my terminal–if I even could.

I finished my work in a fraction of the time it would have taken me on the terminal, so I continued exploring. On my electronic desktop I clicked on the icons for a clock and a calculator, for communicating via modem, sending mail, drawing charts and graphs, and creating databases and spreadsheets. Everything I tried not only worked, but was easy to learn.

All too soon I remembered that my life in GUIWorld was temporary. As the "Big Ben Icon" chimed the hour of midnight, my screen began to fade. The icons slid down the desktop and into the wastebasket. As the brilliant colors vanished, the orange characters and old menus returned. Even the mouse scurried away. In place of its pad was my reporter's notebook.

The next day I bought myself a 486 clone to use with Microsoft Windows and The Santa Cruz Operation's Open Desktop. Thanks to the aliens, I realized I had resisted moving to a GUI because I had invested so much time learning arcane commands and mindless menu trails. My trip to GUIWorld taught me firsthand about the productivity of using a graphical environment. Now if my family would just give me some time on the machine! ■

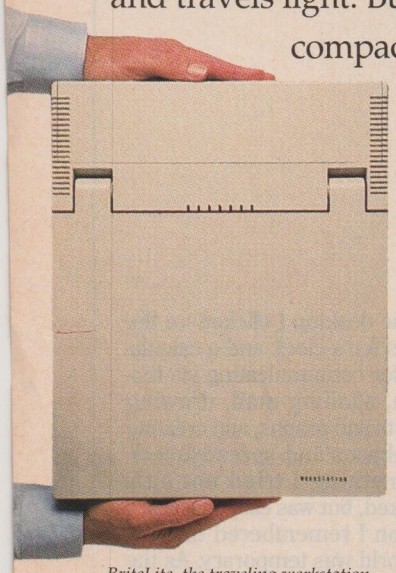
Dave Flack

INTRODUCING BRITELITE.™ LAPTOP WORKSTATION

At 13.5 lbs. (batteries included) BriteLite is small and travels light. But looks can be deceiving. The compact little BriteLite is, in fact, the world's first battery-operated laptop workstation.

What makes it a workstation? Power.

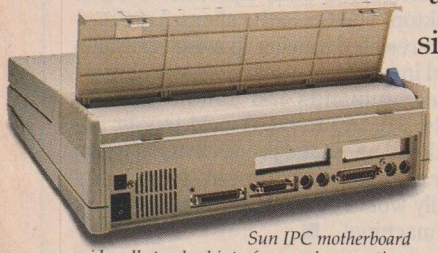
Using Sun's IPC™ board, BriteLite has the power to crack problems and crunch numbers that before could only be tackled on desktop workstations.



BriteLite–the traveling workstation– occupies less than .4 cubic feet of space.

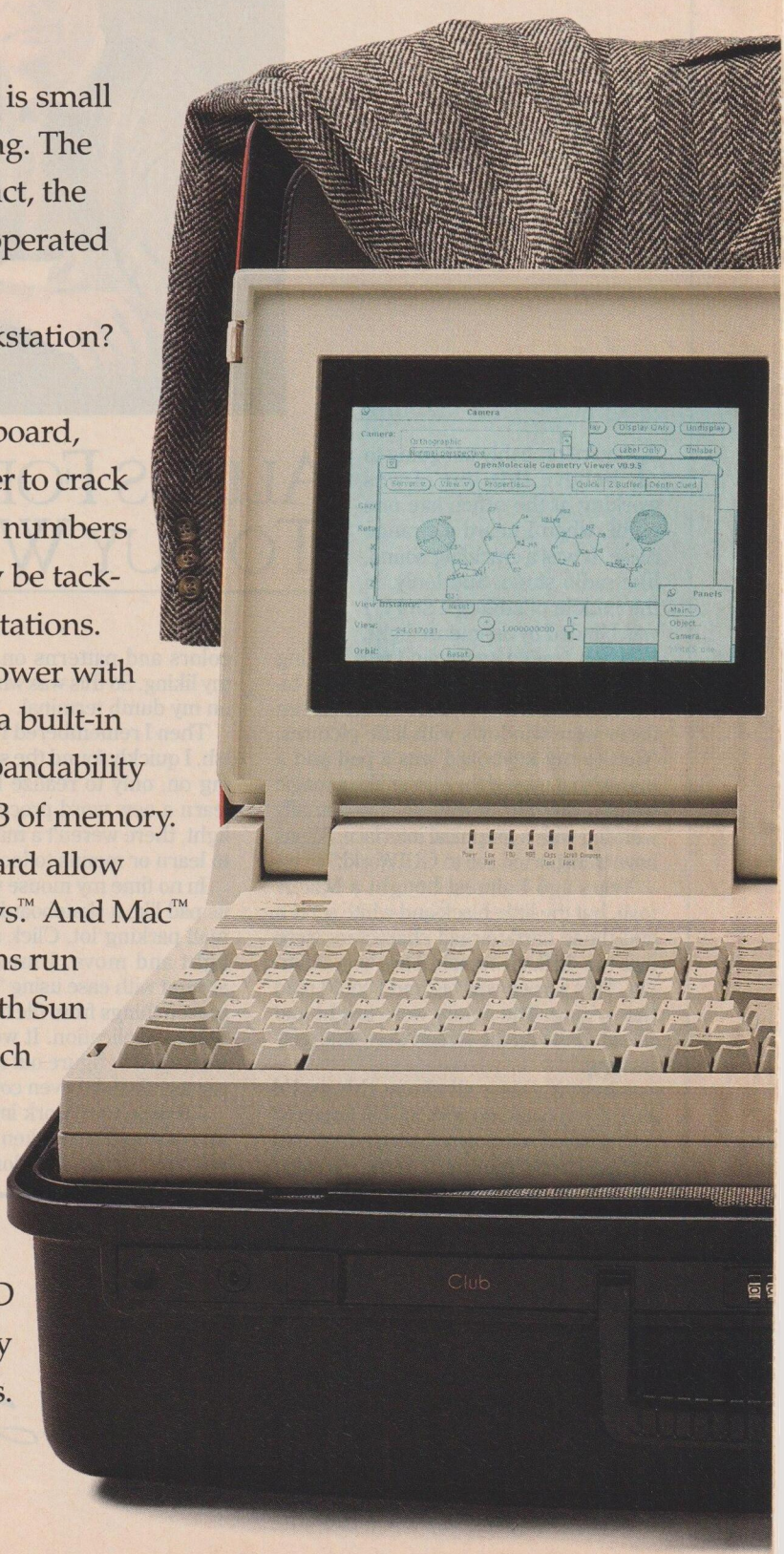
Real workstation power with connectivity through a built-in ethernet interface and two serial ports. Expandability through a SCSI-2 interface and up to 48 MB of memory.

The power of UNIX and the Sun IPC board allow BriteLite to run SunOS™ with OpenWindows.™ And Mac™ and DOS programs run simultaneously with Sun applications, each in their own windows at "state of the art" speeds.



Sun IPC motherboard provides all standard interfaces and connections. Batteries insert easily for complete portability.

BriteLite's new thin-film, super-twist, LCD display technology presents a clearer display outdoors than most laptops provide indoors.

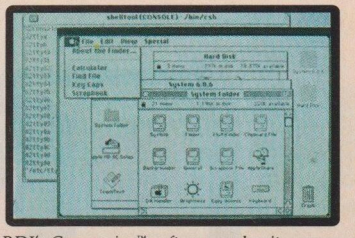


THE MOST POWERFUL TO EVER HIT THE ROAD.

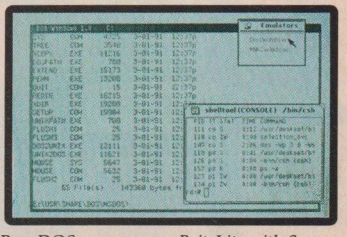
Even the battery power is impressive. Enough power to perform for two solid hours of continuous use and six hours in standby mode before the rechargeable batteries need a boost.

BriteLite Highlights

• Runs SunOS and Open Windows • Sun IPC board • 103 full-size keys • 8 to 48 MB of memory • 120 MB hard disk drive • 3.5″ floppy disk drive • Built-in ethernet interface • SCSI-2 interface • Two serial ports • 4-axis cursor key, optional 3-button mouse • Backlit, LCD display • Rechargeable NiCad batteries • Power conservation mode



RDI's Companion™ software makes it possible to run Macintosh applications on BriteLite or any Sun System.



Run DOS programs on BriteLite with Sun and Mac applications, simultaneously.

In short, this little powerhouse is laps ahead of anything on the road today.

For more information about RDI's powerful BriteLite, call 619-558-6985 or fax us at 619-558-8943.

RDI COMPUTER CORP.

6696 Mesa Ridge Rd., Bldg. A, San Diego, CA 92121

BriteLite, Companion and RDI are trademarks of RDI Computer Corp. Sun, SunOS, IPC and OpenWindows are trademarks of Sun Microsystems, Inc. Mac is a trademark of Apple Computer. All other products mentioned are trademarks of their respective companies. © 1991 RDI Computer Corp.

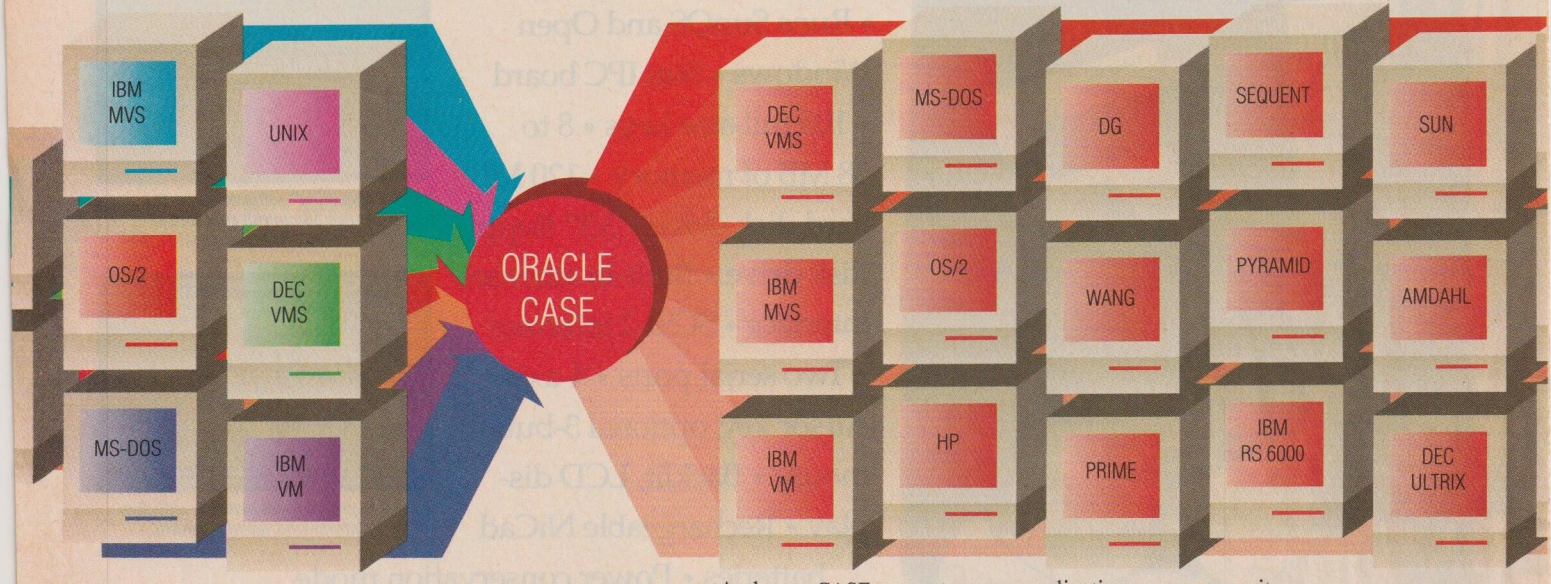
CIRCLE NO. 101 ON INQUIRY CARD

Only Oracle CASE allows teams of developers to jointly design and build database applications that run on virtually all the computers in your organization. Mainframes, minicomputers, workstations and PCs.

Oracle CASE supports the full lifecycle of systems development. From strategic planning, analysis and design to on-line generation, production and maintenance. Using sophisticated diagrammers for entity-relationship models, function hierarchies, dataflow analysis and matrices. All integrated with a comprehensive set of application development tools and utilities.

Oracle CASE lets you develop applications anywhere. And run them everywhere.

Developers' efforts are fully coordinated via a shared, on-line repository. Which can reside on virtually any platform, and be accessed by just about any combination of terminals and workstations. So developers can truly work as teams to improve productivity, while eliminating errors and redundancies.



And once CASE generates your application, you can run it on virtually all your computers. From PCs through mainframes. Oracle also offers comprehensive services to transfer our CASE expertise to you. Including full support, education and consulting to maximize your success with CASE technology.

1-800-633-0525 Ext. 3435

Call us now, and register for the free Oracle CASE Technology Seminar in your area.

You'll see why Oracle offers the best CASE scenario.

ORACLE®

Software that runs on all your computers.

© 1991 Oracle Corporation. ORACLE is a registered trademark of Oracle Corporation. All other trademarks referenced are the service marks, trademarks, or registered trademarks of the respective manufacturers. Call 1-800-ORACLE1 for hardware and software requirements. *In CANADA please call 1-800-668-8925 for product and seminar information.

ACE IN THE HOLE FOR MIPS?

In a ballroom in the posh Waldorf-Astoria Hotel in New York City, Microsoft's Bill Gates, MIPS Computer Systems' Robert Miller, Digital Equipment Corp.'s Ken Olsen, Compaq Computer's Rod Canion, and The Santa Cruz Operation's Doug Michels each took turns talking about a just-announced major alliance. These men are not Steve Jobs-like impresarios, but as the photographers' flashguns flashed and the humidity crept into the room, they tried to explain how this was the "broadest," "most extensive," "most dramatic announcement ever" in the computer industry.

Many audience members were befuddled by the hype centered around the announcement of the Advanced Computing Environment (ACE) initiative, a group of 21 companies backing the MIPS chip, a unified UNIX system from SCO, and a new operating system from Microsoft.

These vendors hope to establish a standard for computers based on Reduced Instruction Set Computing (RISC) technology from MIPS. The R3000 chip from MIPS will be made to comply with ACE specifications and the R4000 will comply from the outset, according to Robert Miller, MIPS' chairman and CEO. The participating companies want to persuade software makers to create programs for ACE machines that will challenge established RISC players like Sun Microsystems and IBM.

"ACE is about bringing together the best of the PC world and the best of the workstation world," says Microsoft chairman Gates. "This is the most dramatic thing since the beginning of the PC industry."

Many analysts agree that the implications of the announcement are dramatic, mostly because of the power base of the 21 participating companies. Together they account for $50 billion of worldwide computer and software sales.

The announcement asks many more questions than it answers, but the biggest benefactor is certainly MIPS, because hardware vendors DEC, Compaq, Silicon Graphics, NEC, Sony, Sumitomo, and Bull have all thrown their weight behind it.

This announcement pits the MIPS chip against chips designed by Motorola, Intel, IBM, and Sun. In 1990, Sun's SPARC was the dominant processor with 65% of workstation shipments, according to International Data Corp. MIPS had its chips in 18% of the workstation shipments, IBM had 8%, and the remaining 9% was splintered among other vendors.

Compaq's endorsement of the MIPS chip is a certain blow to Sun. The Sun-sponsored SPARC International–an independent organization for SPARC vendors–had been courting Compaq for an endorsement of SPARC. The ACE initiative is aimed at slicing Sun's market share, say analysts. "Sun is being punched on all sides," says George D. Elling, an analyst with Merrill Lynch, "but I doubt if it's worried at this point."

MICROSOFT VS. SCO?

Although the chip battle has garnered most of the attention from the ACE announcement, there are other implications, especially for Microsoft and SCO. As part of the initiative, Microsoft's new OS/2 3.0 operating system will be supported on X86-based desktop and server platforms, and the MIPS-based platform. OS/2 3.0 is a 32-bit operating system with "full Windows and OS/2 applications support," says Carl Stork, Microsoft's advanced development business manager. He says the operating system is based on a microkernel approach and symmetrical multiprocessing. "It's OS/2 for workstations and servers with Windows compatibility," he adds.

continued

Version 1.3, Microsoft's earlier version of OS/2, has had profound problems. It has not attracted important software applications, and has a paltry installed base of 150,000. Microsoft projects an additional 150,000 OS/2 shipments in 1991. If software developers already disenchanted with the earlier version of OS/2 don't want to write applications for OS/2 3.0, the alliance could fail, say analysts.

"We're not worried about this version getting out of the block," insists Stork. "The addition of full Windows support will make a big difference. It will have applications support, which has been the challenge for OS/2."

He says 3.0 is based on Microsoft's New Technology (NT) foundation, a new set of operating systems software "underpinnings" that includes portability, symmetric multiprocessing, and security.

The UNIX-like capabilities of OS/2 3.0 could impinge on the strengths of SCO's OpenDesktop and take away its market if OS/2 is successful in garnering support, some analysts speculate. It's an assertion Doug Michels, executive vice president and cofounder of SCO, denies. "Customers have different needs," he says. "If that happens the market will tell us that, but the market hasn't told us that yet."

No one can deny Microsoft's ability to dominate a market. "Bill [Gates of Microsoft] is aiming at world domination," says David Tory, president of the Open Software Foundation. But Microsoft hasn't even released version 2.0 yet–Gates says it will be available at the end of 1991. Microsoft will provide developer kits for 3.0 this year, he says.

COMPAQ'S HOPES

The success or failure of OS/2 3.0 will affect Compaq the most because of Compaq's dependence on support from its mainly PC-based customers. "The Microsoft piece is crucial," says John Paul, director of systems engineering at Compaq.

Compaq representatives says the ACE initiative is a significant step toward OS/2 and/or UNIX on the desktop. "A UNIX System Laboratories or an OSF can't really extend their definition to encompass hardware," says J. Steven Flannigan, vice president systems engineering at Compaq. "This initiative clearly extends to include the hardware. This is not the death of UNIX."

Flannigan says customers have been approaching Compaq and describing the need for RISC-based platforms for two years. "It took us a long time to realize that there was no one flavor of hardware or software that could solve the needs of all these customers," he says. Compaq has tried to move into the server market through its new Systempro midrange system. This new agreement is seen as a way for Compaq to move into this market more effectively.

Compaq made another move into the high-end workstation market when it bought 13% of Silicon Graphics in early April. Silicon Graphics will leverage Compaq's marketing skills and Compaq will garner expertise in the workstation business from Silicon Graphics, says John Metcalfe, vice president of Silicon Graphics' entry system division. "We're very excited," he says. "We're going to be able to substantially expand our market now."

He says Silicon Graphics won't concentrate on selling its systems to *Fortune* 1000 companies for business applications, like Sun has tried to do with its low-end IPC. He says Silicon Graphics will concentrate on the scientific/engineering market and let Compaq concentrate on RISC machines for business application customers.

A BIG FLOP?

The ACE initiative's impact on the computer industry will not be known until well into 1992 when it has some shipping products to go along with its hopes. It may have created more confusion in an industry that is already confused. The alliance will be successful if software developers can be persuaded to write applications for the new platform, if the large companies in the alliance can be efficient and work together, if MIPS can deliver its chip, and if Microsoft can deliver its operating system. These are a lot of significant "ifs." If these goals are attained, the ACE initiative could be the "broadest," "most extensive," "most dramatic announcement ever" in the computer industry. If these goals aren't attained, ACE could be one of its biggest flops.

continued

Make the profitable switch to multi-user

Few organizations have helped more remarketers realize the market potential in multi-user AIX™ and SCO™ than Dickens Data Systems and Computone.

DDS and Computone have pooled technologies to develop a full range of state-of-the-art intelligent multiport boards for both AIX and SCO systems on both INTEL® and IBM® RISC platforms.

Beginning with the IBM RT System,™ DDS and Computone worked together to create an advanced communications board to put IBM's first generation RISC technology at the disposal of multiple on-line users.

And when the RISC System/6000™ development got underway, IBM called on that expertise again to provide the 64-port I/O subsystem for IBM.

Now DDS line of multiport products carries the DDS/Computone partnership into AIX *and* SCO support of Intel-based architectures as well.

Dickens Data Systems is helping remarketers across the country make AIX and SCO based multi-user systems available to their cost-conscious customers. And Computone is a big part of the DDS solution. Let Dickens Data Systems configure the multiport communications solution that's right for your marketing needs. You'll have two of the best names in the business behind you. Call today at 404-448-6177.

DICKENS
DATA SYSTEMS

COMPUTONE

SCO is a registered trademark of The Santa Cruz Operation, Inc. Intel is a registered trademark of Intel Corporation. RT system, RISC System/6000 and AIX are trademarks and IBM is a registered trademark of International Business Machines Corporation.

CIRCLE NO. 187 ON INQUIRY CARD

FROM CONFLICT TOWARD COMPROMISE

The NCR-AT&T wrestling match is coming to an end. NCR has eluded AT&T's takeover bid since the beginning of 1991, but the Dayton, Ohio-based company will become a part of AT&T by next year, say analysts. In NCR's annual meeting this spring, AT&T tried to secure a majority of seats on NCR's board. AT&T didn't get the 80% vote needed to oust all of NCR's directors and effectively take over the company, but it did get four directors on the 12-person board. When more directors come up for election next year, analysts predict that AT&T will be able to take over the board.

In Dayton, conflict has turned to tepid cooperation as NCR struggles with the reality of becoming a part of AT&T. "It's not like a merger of conflicting companies," says a diplomatic Bill Eisenman, vice president of NCR's multiuser product division. "We would welcome a chance to be independent, but we have to be ready for AT&T [to take us over]."

"It's clear that NCR is going to be bought," says George Colony, president of Forrester Research. "The short term effect will be minimal, but after two years this will be a disaster for NCR. There will be a loss of life at NCR's executive level. AT&T will destroy NCR's culture."

WORMING INTO THE SUPREME COURT

Robert T. Morris, convicted of releasing a worm program that shut down the Internet network in 1988, may take his case to the Supreme Court, according to his lawyer.

Morris will file a petition at the Supreme Court in early June if he decides to appeal his case there. His lawyer, Thomas Guidoboni, says the case has "little chance of being heard by the Supreme Court" because the infancy of computer crime law doesn't give enough conflicting opinions to justify a precedent-setting case.

Petitioning the Supreme Court is Morris' last option. In March, he lost a unanimous decision in the U.S. Court of Appeals for the Second Circuit under the Computer Fraud and Abuse Act of 1988. In the decision, the appellate judges upheld the trial court ruling, maintaining that the government was not required under the federal statute to prove Morris intended to cause harm. It also found that he clearly lacked the authorization to access the computers on Internet that the worm program invaded. Morris was sentenced to three years' probation, 400 hours of community service, and fined $10,000.

Morris is reportedly working as a programmer at a software firm in Cambridge, Mass. "With his job and his community service work," says Guidoboni, "he's keeping *very* busy."

IS NEXT NUMBER TWO?

Next Inc. claims it's now the number-two maker of "professional workstations" behind Sun. Next reports that it sold 8,000 systems in the first three months of 1991, all as "professional workstations" intended for non-technical users. Next's President Steven P. Jobs estimates that Sun sold only about 11,000 machines into that non-technical market in the last quarter of 1990, and that other workstation vendors sold only a thousand or so each, so Next has "nearly matched" the market leader.

If Next's speculative statistics don't stretch credibility enough, Jobs also announced that Next is rapidly expanding its dealer base, placing greater emphasis on direct sales and planning to quadruple the number of Next value-added resellers. They'll need it: Missing from the rosy projections is the fact that Next's exclusive retail arrangement with Businessland ended in January, and by early April Next was down to about two dozen retailers in the United States.

Still, Jobs says Next is projecting sales of between 40,000 and 50,000 "professional workstations" in 1991, a big improvement over the 11,000 systems the company sold in 1990. No source was cited for the 1991 statistics. In the first quarter of 1991, 60% of Next's sales was to business and government, 40% to education (Next's education sales are heavily discounted), and 30% of the machines was sold outside the United States.

continued

"ALR's superior price, performance, technology, network compatibility, and upgradeability made the POWERPRO the file server for us over AST, IBM, and Compaq."
Jewish Federation/Jewish United Fund of Chicago

Novell Labs Tested & Approved

BANYAN SMP Certified

Our Competition Thinks Two Against One isn't Fair... They're Right.

Computer ResellerNews Editors' Choice

We admit, it doesn't seem fair. Every ALR POWERPRO is either dual processor ready or pre-equipped with two 33-MHz, i486™ processors. Most competitive PCs in the POWERPRO's price range only have one processor. And no matter how much time goes by or how much technology advances, that's all they'll ever have. Dual processing models of the POWERPRO even cost less than single CPU models of COMPAQ's® SYSTEMPRO™. So how can our competition possibly compete?

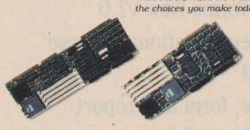
They can't.

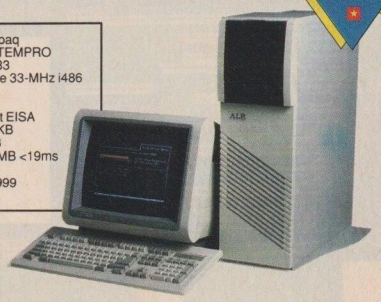
Designed with an emphasis on interoperable compatibility, the POWERPRO can provide up to 40 VAX MIPS of processing power as a single user workstation, a UNIX™ workgroup host, or a Banyan® VINES™ or Novell® Network server. A wide range of applications such as CAD/CAM, office automation, and manufacturing management can all benefit from the dual processing power, 17-MB of standard RAM, and up to 1-MB of high speed RAM cache found on most POWERPRO models.

What if I don't need all that power today?
Simple. Choose one of the single processor VM models of the POWERPRO. With one 33-MHz i486 processor, 5-MB of RAM, and 64-KB of external cache, VM models can provide you with precisely the type of power your business needs today at a price that's more than competitive with ordinary single processor systems. But, unlike ordinary single processor systems, the POWERPRO gives you the ability to *Just Upgrade the CPU!*™ to dual processing in the future.

Manufacturer	ALR	ALR	Compaq
Model Name	POWERPRO 486/33 VM 64	POWERPRO 486/33 SMP 512	SYSTEMPRO 486/33
CPU	Single 33-MHz i486	Single 33-MHz i486	Single 33-MHz i486
# of Processors	1	1	1
Max. # of Processors	2	2	2
Bus Architecture	32-bit EISA	32-bit EISA	32-bit EISA
Memory Cache	64-KB	512-KB	512-KB
RAM Std.	5-MB	17-MB	8-MB
Hard Drive	none	330-MB <18ms	240-MB <19ms
Expansion Slots	12	12	11
Price	$7,495	$14,495	$16,999

With the POWERPRO's advanced modular system architecture, the choices you make today won't limit your options tommorrow





And to keep pace with your evolving needs, every POWERPRO comes with ample expansion capabilities. Add up to a total of 49-MB of RAM. Increase data storage capacity up to 2.5 Gigabytes (up to 10-GB with an ALR external expansion chassis). With ALR PRO-CACHE modules, you can even expand RAM cache up to a total of 1-MB.

To keep all this data moving smoothly, the POWERPRO also comes with a true **32-bit EISA bus**, so you'll have maximum compatibility with both the latest in intelligent 32-bit enhancement products and low-cost "AT" compatible hardware. Up to 12 available expansion slots give you plenty of room for customization.

intel inside

Available at these selected Resellers:

ALR Power Partner Resellers · Connecting Point Computer Centers · ENTRIC · CBC · JWP Information Systems Computer Systems Group

Prices and configurations subject to change without notice. Prices based on U.S. dollars. ALR is a registered trademark of Advanced Logic Research, Inc. "The Intel Inside logo is a trademark of Intel Corporation." All other brand and product names are trademarks or registered trademarks of their respective owners.
© 1991 by Advanced Logic Research, Inc.

CIRCLE NO. 14 ON INQUIRY CARD

The ALR POWERPRO

Mainframe Features/PC Pricing

Designed with the same type of technology found in $100,000 mainframe systems, the POWERPRO is a performance leader among PCs. A mainframe-like read-and-write-back cache design provides greater data efficiency than the standard write-through architecture found on the SYSTEMPRO. Likewise, ALR's SCSI SDA (Software Disk Array), which is standard on many models, provides POWERPROs operating within the UNIX environment with the same type of data storage fault-tolerance and high speed disk performance found on mini and mainframe computers.

Simply put, the ALR POWERPRO offers you twice the computer for less money.

To find out just how fair a deal it is, visit your favorite authorized ALR reseller, or call:

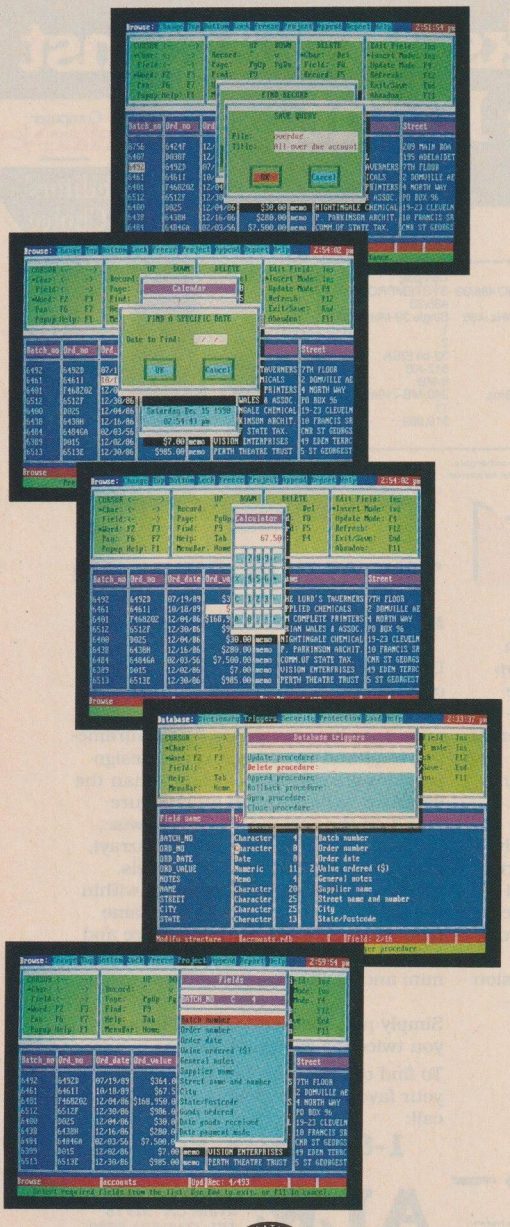
1-800-BUY-POWR

ALR® Advanced Logic Research, Inc.

9401 Jeronimo,
Irvine, CA 92718
TEL: (714) 581-6770;
FAX (714) 581-9240

Recital 7.0 Is The Only Choice.

So much beauty...



So much power...

- Advanced RDBMS/4GL
- Active Data Dictionary
- Object-oriented with pre-defined "application objects"
- Open client/server architecture
- Integrated pop-ups for calendar, calculator, choice lists
- Built in "Dynamic Compiler" New v7.0
- Pop-up time management scheduler New v7.0
- Relational multi-record table fields in forms New v7.0
- Split screen relational browse New v7.0
- Database, form and report triggers New v7.0
- Automatic record locking
- Supports 14 datatypes including memo, numeric, byte, integer, short, character, date, logical, float, real, packed, zoned, vaxdate, quadword

So much understanding...

- Available now on 100+ VAX/VMS and UNIX computers (including full VAX cluster support)
- SQL (interactive and embedded)
- dBASE, FoxBase and Clipper compatibility (yes, even on VMS!)
- Terminal (including full color support) and keyboard independence
- Transparent connectivity to existing RMS and RDB databases on VAX/VMS
- Completely integrated development environment
- Powerful end-user tools

All in One Affordable Package

Don't be fooled by the others. Order the real thing today.
Call our UNIX or VMS desk for your Recital Rehearsal Pack.

Recital
CORPORATION

BEAUTY, POWER, AND UNDERSTANDING

Rdb SVP SOLUTIONS • VENDOR • PROGRAM

88open COMPATIBILITY CERTIFIED

Recital Corporation Inc., 85 Constitution Lane, Danvers, MA 01923, Tel (508) 750-1066, Fax (508) 750-8097
Recital Corporation LTD, South Bank Technopark, 90 London Road, London SE1 6LN, United Kingdom, Tel 071-401-2727, Fax 071-633-9617

CIRCLE NO. 244 ON INQUIRY CARD

Last November, when Next rolled out its NextStation, the company said it had a backlog of 15,000 orders, based on sneak previews of the new machine. How many machines are just filling backorders? "A quarter to a third," says a Next spokesperson, and those orders will be filled over the course of the year, she adds.

SYBASE ACQUIRES DEFT

In an effort to provide integrated computer-aided software engineering (CASE) tools, Sybase has acquired Deft Inc., a Toronto-based vendor. Financial terms of the deal were not disclosed. Deft products are designed for relational database management systems (RDBMS). Deft runs on the Macintosh and is used for designing and developing RDBMS-based applications for UNIX and VAX environments.

"This acquisition plugs a hole for Sybase," says Charles Phillips, an analyst with Soundview. He says Sybase's primary competitors–Oracle and Informix–have had a competitive advantage over Sybase because of their integrated CASE tool products. Phillips predicts total integration of Deft's CASE tools into Sybase's products will take 12 months.

In the meantime, Sybase will sell Deft products to Sybase's existing product base through its direct sales force, says Perry Mizota, Sybase's marketing manager. It will also sell Deft through SQL Solutions, a consulting firm bought by Sybase in January 1990.

AT&T TO X: PAY UP

AT&T says MIT's X Window System is using Bell Labs technology without permission. In February, AT&T's patent-licensing office sent letters to some members of the X Consortium, explaining that X Window "backing store" functions use patented AT&T software techniques developed at Bell Labs, and asking the developers to contact AT&T "to discuss licensing arrangements."

The dispute isn't over the generic notion of backing store, which means keeping track of the contents of windows that are overlapped by other windows on a bit-mapped screen. Rather, AT&T says, the X Window backing store function uses a specific technique developed a decade ago by Bell Labs researcher Rob Pike for the AT&T Blit terminal. The company says Pike described the technique at SIGGRAPH in 1983 and AT&T was granted a patent on it in 1985. Backing store functionality was added to X Windows with X11 Release 3. AT&T says it's not trying to collect patent royalties from users; "It's when they turn it into commercial products that we want to collect royalties," according to an AT&T company representative.

MIT's X Consortium had no official response, though one MIT official privately admits that the university's lawyers are searching for uses of the backing store technique that predate the AT&T patent application in order to have the AT&T patent invalidated. Other consortium alternatives include removing backing store capabilities from the X Windows distribution, rewriting the implementation to use a non-patented approach, or negotiating a blanket license for use of the technique.

GROUPE BULL ANNOUNCES DISTRIBUTED COMPUTING MODEL

Add Groupe Bull to the list of vendors interested in distributed computing. Bull has announced its Bull Distributed Computing Model, which it hopes will eventually put enterprise information and applications on every desktop in an organization. The model provides customers and software developers with a development framework and set of specifications for services, application interfaces, and exchange protocols for enterprise computing, say company spokespeople. The framework, announced at the Cebit conference in Hannover, Germany, is based around OSF's distributed computing environment (DCE) standards.

"In the past our approach was selling individual boxes," says Steve Gardner, Bull's

vice president of U.S. marketing. "But that approach has changed. We're not a box vendor anymore."

"Their installed base is happy with this announcement because it allows them a future gateway to Bull's new products," says Wayne Kernochan, a senior analyst with the Yankee Group. He adds that Bull's proprietary GCOS operating system users can move to UNIX systems. Kernochan says Bull's strategy is sound for its installed base, but financial problems have "tainted" its ability to go outside the installed base to capture new customers.

HP AND IBM WANT LYNX

Lynx Real-Time Systems, a UNIX-compatible real-time software vendor, has signed an agreement with Hewlett-Packard. Some insiders think it means the end of HP-grown real-time implementations on HP-UX. "HP-UX is in an identity crisis," says one person close to the deal who requested anonymity.

HP hasn't been able to successfully "hack UNIX to make it real-time," adds Paul Cubbage, an analyst with Dataquest.

With this deal, reportedly worth $8 to $10 million for Lynx, HP plans to port Lynx's operating system, LynxOS, to its PA-RISC chip. This means LynxOS will be able to run on all HP RISC machines. The deal has reportedly raised the ire of the HP-UX division because it could be a strong blow to the division, which has been unsuccessful in its real-time implementations. Many users who want real-time functionality will probably choose LynxOS over HP-UX, says Cubbage.

Other hardware vendors have made strong overtones to capture Lynx's technology too. Lynx won a contract last year with NASA for LynxOS to be used on the Space Shuttle. IBM's version of UNIX–AIX–was one of the losers in that bid. Sources at Lynx and analysts say IBM has realized its shortcomings in real-time software and tried to buy Lynx. Lynx is resisting these overtures, sources say. Sun is also pushing for real-time capabilities. LynxOS will be standardized on the SPARC chip by the end of the year.

OVERHEARD

Jonathan Gossels, business area manager for OSF, recalling how an instructor described UNIX: "Sure it's cryptic and hard to use–that's the beauty of it."

"I don't know if anyone has tried to run Windows on a 286 machine, but frankly I'd rather have knitting needles in my eyes." —Aaron Goldberg, vice president, desktop workstation research, IDC.

Goldberg on Compaq: "They're the Ronald Reagan of the industry. They're like Teflon, nothing sticks to them."

Lee Levitt, director, distribution channels, IDC: "VARs keep asking themselves, how many vendors should we carry? One is not enough and two is too many!"

Frank Gens, vice president, Technology Investment Strategies Corp.: "If the mainframe business is dead, it's a hell of a big corpse."

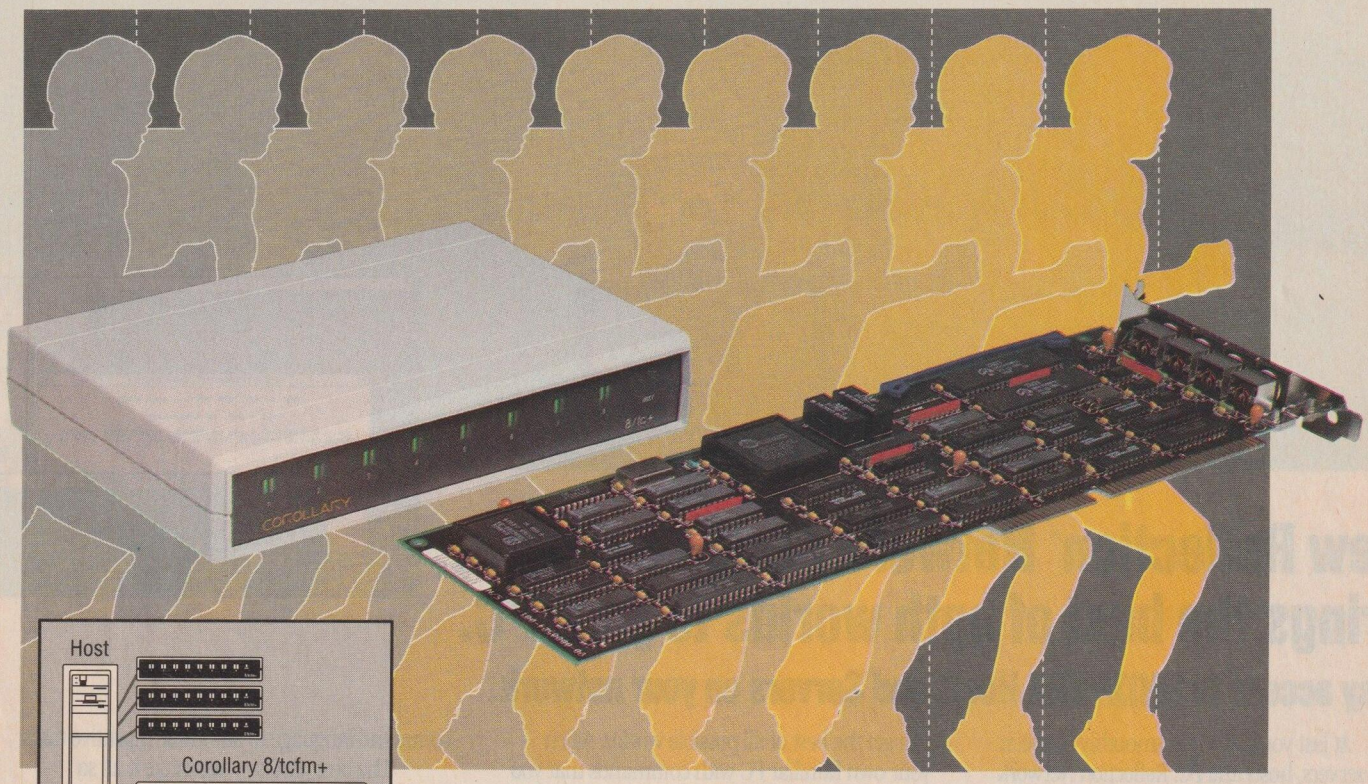
Bill Eisenman, vice president of NCR's multiuser product division, on AT&T's Bob Kavner who gave a speech at NCR's annual meeting: "It was like someone going into Kuwait and telling them how great the Iraqis are." ■

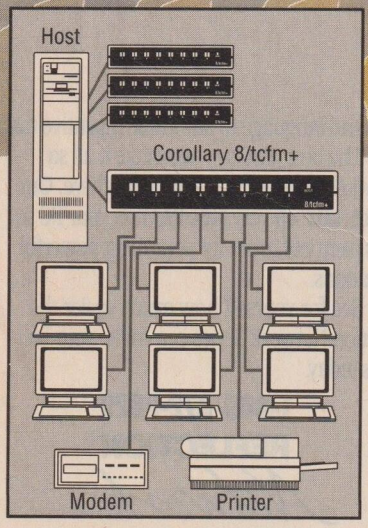
—Edited by Gary Andrew Poole with staff reports. Please send any breaking news or comments to him at: `uunet!uworld!garyp` *or* `garyp@uworld.com`. *Or call him at 415-940-1500.*

NEW 286 Power!

New Corollary 8x4GT 32-port I/O subsystem.

More power for the long run.





Use up to four 8-port terminal concentrators. 8x4GT with 286 processor.

Take the power of Corollary's terminal concentrator-based multiport solutions. Add a powerful 286. It's the potent new 8x4GT™ 32-port intelligent I/O subsystem.

Like all Corollary multiport products, the 8x4GT can be "mixed and matched" as your SCO UNIX needs grow. Prices start at $895 for board and software.

The 8x4GT features:

- High throughput right out to 32-ports.
- Support up to 128 users in a four board system.
- Terminal concentrators can be located up to 1,000-ft. from the host.
- Structured wiring eliminates cable clutter, simplifies installation and lowers maintenance costs.

OEM's like HP, DEC and ALR use Corollary, shouldn't you? Send for our new Benchmark Performance Report—we'll send you a handy RS-232 tester, free!

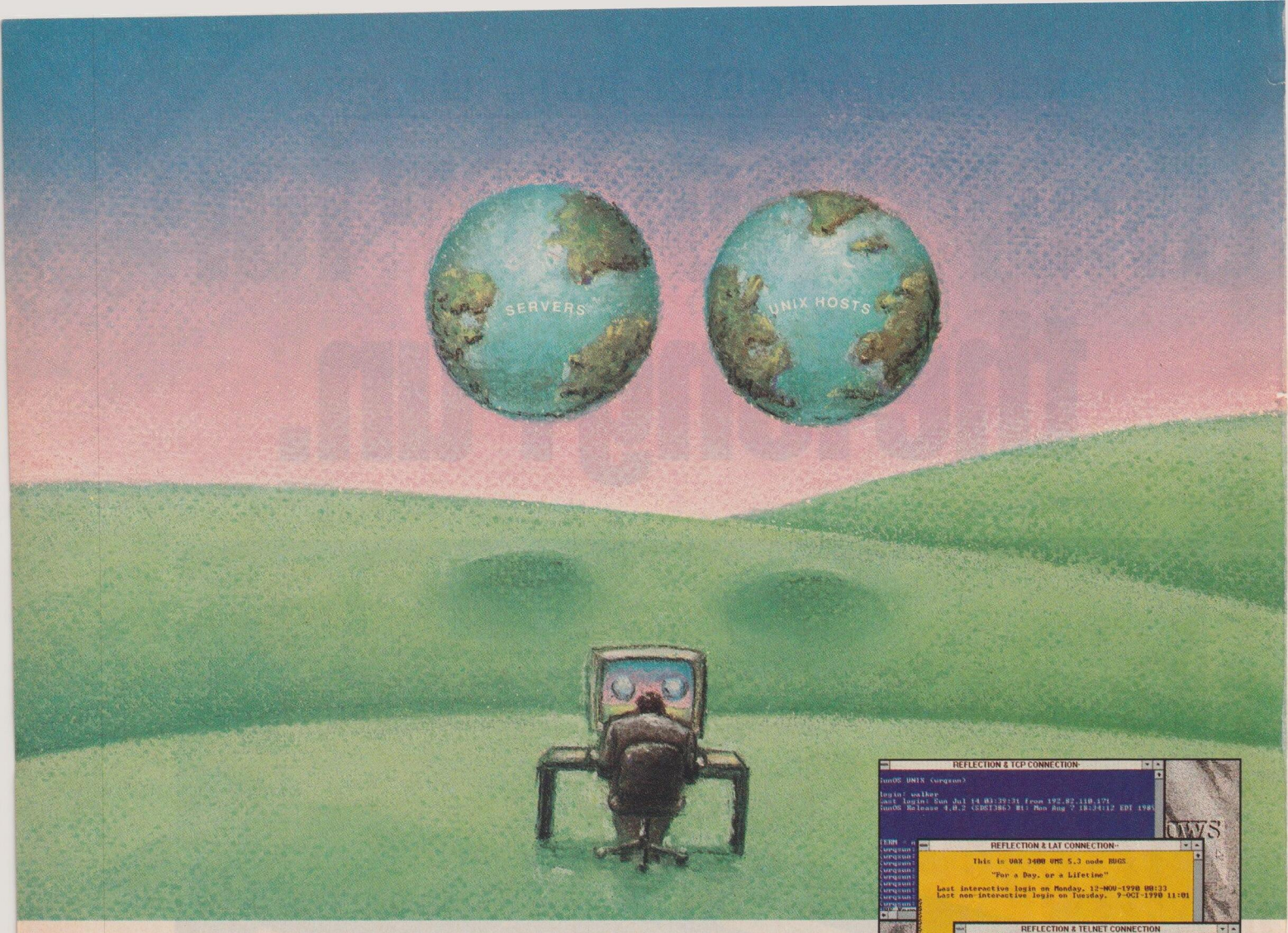
(800) 338-4020

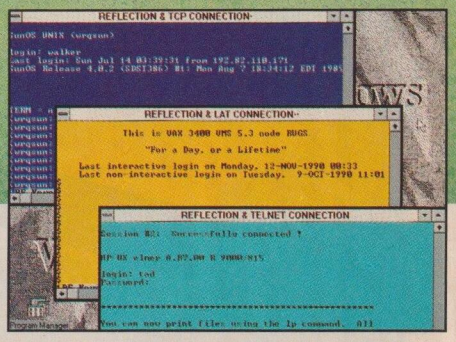
In California (714) 250-4040, FAX (714) 250-4043

COROLLARY

© 1991 Corollary, Inc. Corollary 8x4GT is a registered trademark of Corollary, Inc. All other trademarks and copyrights acknowledged.

CIRCLE NO. 95 ON INQUIRY CARD





New Reflection® Network Series Software brings the best of both worlds to your PC.

Easy access to UNIX/VAX Hosts and Servers on your network.

At last you can move smoothly between your servers, hosts and PC. Reflection Network Series Software puts them all at your fingertips. No more rebooting when you have to transfer a file. Run several sessions on multiple hosts from any PC on your network.

Versatile Reflection terminal emulation software with its robust user interface becomes the common denominator. UNIX and VAX hosts over Ethernet, using TCP/IP and LAT with your Novell, 3Com or other leading LAN. Whatever your network configuration, we help you communicate with the most elegant, reliable, and transparent connection for your multivendor network.

We call it concurrent access. Quite simply, you get the best of all possible worlds. All on your own familiar PC with commands that you understand. Run multiple sessions in multiple windows. And transfer files between your worlds faster with our own easy-to-use FTP. Easy access for anyone and everyone on your network.

Slide effortlessly from one environment to another. Whatever communication protocols are required, you'll install and remove them on demand.

Bringing these two worlds together makes your work simpler and faster. And it doesn't cost that much. Let us show you. You'll find Reflection Network Series will save you time and money. You can even use our powerful command language to automate repetitive tasks.

The best part is — we make it all so easy, you'll never even know we're there. Our products take up very little RAM on your PC so there's plenty of room for your most powerful applications.

See for yourself how much easier the Reflection Network Series can make your life. Call us today.

1-800-872-2829

REFLECTION®
Network
SERIES

Walker Richer & Quinn, Inc.

2815 Eastlake Avenue East, Seattle, Washington 98102, 206.324.0407, FAX: 206.322.8151 / Zeestraat 55, 2518 AA Den Haag, The Netherlands, +31. (0)70.356.09.63, FAX: +31. (0)70.356.12.44

Reflection Network Series Software is a registered trademark of Walker Richer & Quinn, Inc. All other trademarks are the property of their respective holders.

CIRCLE NO. 125 ON INQUIRY CARD

OSF Responds To Our Article

Dear Editor:

"The Debut of a New UNIX," (March 1991) by Rik Farrow, was read with keen interest here at the Open Software Foundation. While Mr. Farrow attempted to provide an unbiased assessment of the capabilities of OSF/1, there are some factual errors in the text that I would like to clear up:

■ OSF/1 currently supports System V Interface Definition Issue 2 (SVID 2) Base and Kernel Extensions, Posix 1003.1, and X/Open Portability Guide Issue 3 support. SVID 3 Base and Kernel Extensions support is planned for Release 1.1.

■ The OSF/1 multiprocessor reference port includes parallelized device drivers for disk, Ethernet, and tape drive.

■ There is no general U.S. government requirement for B1-level systems by 1992, although there may be specific Defense Department procurements requiring B1 or above. Also, while AT&T will have a B2-certified system on its platform in 1991, it does not mean that other platform vendors will be able to ship a B2-certified System V Release 4 platform in the same timeframe. The certification process requires the software to be implemented on the specific hardware to be certified. Thus, each systems vendor will still have to undergo the evaluation process on their particular platforms.

■ OSF/1 supports both 8-bit and 16-bit character sets, including encoded Japanese characters. Additional multibyte support (up to 32-bit) is planned for Release 1.1.

Mr. Farrow has made "apples-to-oranges" comparisons on pricing issues. The price of OSF/1 is all-inclusive. OSF/1 licensees receive the base operating system plus networking (such as TCP/IP, a Network File System-compatible file system), security, logical volume management, and internationalization. This is not the case with SVR4 as available today.

In addition, OSF/1 binary fees, including royalties payable to AT&T for SVR3, are approximately equal to SVR4 for single-user systems with values up to $14,000, and multiuser systems with values up to $23,000. As system costs increase beyond these values, SVR4 binaries become increasingly expensive, while OSF/1 binary costs remain constant.

Regarding the chart, while UNIX System Laboratories has promised its SVR4ES release and an MP release in 1991–these are two entirely separate releases. The earliest that vendors could license an SVR4 system with integrated security and multiprocessing capability is 1992. However, this capability is available today with OSF/1.

Grace I. Perez
Business Area Manager
Open Software Foundation
Cambridge, Mass.

Author Rik Farrow replies: You raise some interesting points in your letter, some of which I will not dispute. On security, however, SVR4 has been available for some time, giving UNIX International vendors a lead in getting Orange Book certification.

As far as pricing goes, just say I'm from Missouri, and show me. As a hardware reviewer, I have often been amazed at the difference between the vendor's listed price and the actual delivery cost once enough has been added to make a working system. I know that the "list price" for OSF/1 is lower for the more expensive platforms. I'm waiting for proof–invoices that I can read.

Listen Up: Threads are Old News

Dear Editor:

The discussion of threads in the article "The Debut of a New UNIX" illustrates the all-too-common bias that UNIX is the only operating system in the world. While your focus on UNIX is understandable, you do your readers a disservice by completely ignoring developments in the rest of the software community.

The article presents threads as an entirely new concept being introduced for the first time in OSF/1 and soon in SVR4. The article also says that writing threaded software "is an art to be mastered by tomorrow's programmers." In fact, threads have been available in Sun Microsystems' operating system for some time and they also have been available in non-UNIX operating systems like IBM's OS/2 much longer. Data General's proprietary AOS/VS operating system has had threads for nearly 10 years, and today's programmers have been successfully using them just as long.

Brad Clements
SoftSolutions
Orem, Utah

Author Rik Farrow replies: I certainly did not mean to imply that threads were a new concept, or even new to UNIX. What's new, however, is that a portable approach to programming in threads is being announced, perhaps prematurely by OSF.

Although threads, or lightweight processes, have been around for a long time, software vendors trying to produce portable code had to avoid threads or create custom ports of their software to different operating systems. That's something good C programmers can avoid. As far as there being a large body of programmers familiar with multiple threads of execution, I would say that there might be as many programmers writing threaded code as there are people writing interrupt-driven device drivers.

LAT and TCP/IP Can Coexist

Dear Editor:

Your editorial "Have You Been Misled About LAT?" (March 1991) made it seem like the confrontation between Local Area Transport and TCP/IP would make a Mike Tyson vs. Evander Holyfield bash look like a well-mannered debate. Actually, LAT vs. TCP/IP is for the most part a non-issue.

Positioning LAT against TCP/IP implies that users must choose between them, and that is not true for most applications. The two can coexist nicely in the same network without piling on enormous overhead or multiple layers of additional communications software.

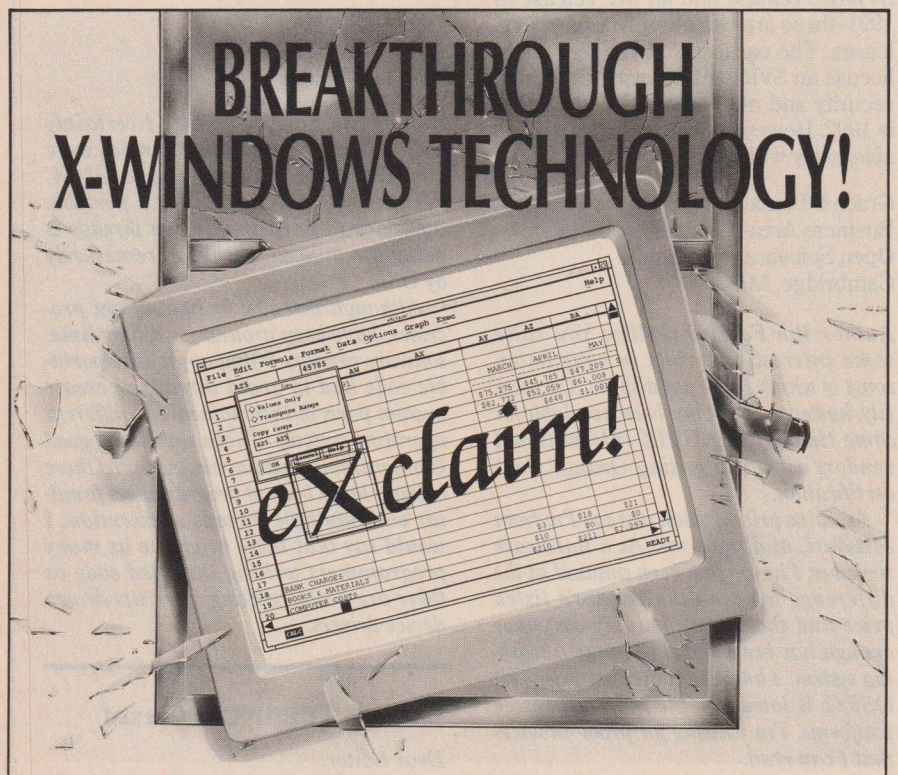
The solution is in your almost-plain-vanilla, off-the-shelf, good old terminal server. They can share other resources like printers or plotters, transport LAT traffic between networks, and provide protocol conversion for host-to-host communications–and they can do all of those things using TCP/IP and LAT concurrently.

Cost is not a major obstacle either.

continued

Terminal servers (I would prefer calling them "communications servers") with concurrent LAT and TCP/IP, and with several asynchronous ports and a parallel port, run as little as $1,495. LAT and TCP/IP are partners, moving towards LAT use within a network and TCP/IP for internetworking. Those are the functions they were designed for, and they are pretty good at them.

Brad Freeburg
President
Lantronix
Laguna Hills, Calif.



Your X-Window System has just opened up new vistas. *eXclaim!* has arrived.

A true graphical spreadsheet program for X-Windows, *eXclaim!* features Motif™ look-and-feel and a full set of worksheet capabilities. Keystroke compatibility with Lotus 1-2-3™ lets you access the full range of 1-2-3 commands, and read and write files in their native format.

eXclaim! offers complete mouse support, pull down menus, multiple windows, dialog boxes, individual cell fonts and colors, and file linking, including a "live link" to *FrameMaker*™ for fantastic financial reports.

QUALITY SOFTWARE PRODUCTS

5711 West Slauson Avenue, Suite 240, Culver City, CA 90230
TEL: (213) 410-0303 (800) 628-3999 FAX: (213) 410-0124
EMAIL: uunet!qsp!sales

Makers of Q-Calc Standard and other award-winning software packages since 1983.

CIRCLE NO. 69 ON INQUIRY CARD

Give Me That Old Standby UUCP

Dear Editor:

Regarding your review of MLink in the February 1991 issue of *UNIXWORLD*, my previous company considered using the MLink protocol and MLink Polling Manager. We found, as you did, that the Polling Manager's interface exhibited little user friendliness or consistency.

The main testing we did was with the file transfer program. We compared MLink to UUCP (HoneyDanBer) using Telebit T1000 modems. Some modems can work faster with MLink and the USR HST gave very high throughput, but could not handle the noisy lines. We chose the Telebits for their proven reliability over noisy phone lines because the ability to handle noisy lines is a must for us. We call over 250 sites, many in small communities across Canada.

The one clear advantage that MLink offered over UUCP was that, after an interrupted transfer, it could pick up where it left off. It is obvious that this is a real time and money saver if a high proportion of your transfers are falling over.

We concluded that it made no economic sense to replace UUCP with MLink. With more than 250 sites, MLink was an expensive alternative with few clear advantages. Sometimes the old standbys just make sense.

Robert Story
Cannes, France

Author Mike Burgard replies: If you own Telebit 1100 modems at all your sites, then UUCP may be faster. For the rest of us, MLink provides significant speed enhancements during data transfers. As far as support goes, CMI has beefed up its staff considerably in the last six to nine months and assured me that their response time is much better.

Coherent Works Just Fine

Dear Editor:

I am an occasional user of Coherent and wanted to comment on your review in the February 1991 issue. I find Coherent to be a good value and a good product for my uses. I have SunOS and Ultrix operating systems at work, and having a UNIX "lightweight" at home suits me fine. It is good enough to work on shell scripts and I can use UUCP to get mail and files. I had none of the difficulties the reviewer found and am quite satisfied with it.

There is one glaring error in the re-

High Praise.

Lantronix's combination of LAT and TCP/IP connections, small size, command enhancements and reasonable price make this a noteworthy terminal server.

Using the ETS-16, you can provide services to both LAT and TCP/IP hosts. The unit doesn't care which type of host uses a service, and it can queue LAT and TCP/IP print jobs to the same service simultaneously.

It's well suited for workgroup configurations in which connectivity with VMS and UNIX is essential.

Installing the ETS-16 is straightforward.

Anyone familiar with a DECserver can configure a Lantronix terminal server with little trouble.

Beyond simple connections, the ETS-16 can translate between LAT and TCP/IP TELNET protocols. In the simplest form, this allows you to connect to both VMS and UNIX systems from the same terminal.

Lantronix also adopted the UNIX finger command... these commands are excellent enhancements.

Quotes from DP Labs test report published September 1990 in DEC PROFESSIONAL Magazine.

Low Prices.

ETS-8
8-line LAT-TCP Terminal Server

$1695

It's a rare combination: rock-solid terminal servers and rock-bottom prices.

As you can see from DP Labs' test results, these low profile, low priced terminal servers are high on quality and long on features.

All Lantronix terminal servers include:

- Concurrent LAT-TCP/IP
- SNMP compatibility
- IP Security

ETS-16
16-line LAT-TCP Terminal Server

$2495

- SSU-Split Session Utility support for VT330/340 and VT420 terminals
- Protocol Conversion
- RLOGIN
- Reverse TELNET
- TSM/NCP Support
- Advanced gate array and surface mount technology for reduced footprint in distributed networking requirements.
- No fan, no noise

EPS-4
4-line LAT-TCP w/printer port

$1495

- 30-day unconditional guarantee
- Optional Thinwire, Twisted Pair and Thickwire Transceivers available

And there's a lot more. So start thinking small and start saving big.

Call or fax your order today.

1-800-422-7022

LANTRONIX

Lantronix, 26072 Merit Circle, Suite 113, Laguna Hills, CA 92653, (714) 367-0050. FAX: (714) 367-0287. Lantronix, EPS-4, ETS-8 and ETS-16 are trademarks of Lantronix. All other brand or product names are trademarks or registered trademarks of their respective owners.

CIRCLE NO. 219 ON INQUIRY CARD

view. I was surprised to hear Mr. Avant's comments about **compress**, **zcat** and others not being familiar. My **/usr/ucb** directory has them. He must be a System V person. Having a feature article only 11 pages later on the wide dissemination of **compress** just compounds the problem.

Tom Mackay
Interactive Development Environments
Dallas, Texas

Product Reviews Editor Alan Southerton replies: You pegged it. Our reviewer is a System V type of person. Other than that, the fact that you found Coherent flawless, and the review process turned up some minor bugs, reinforces one of the review's themes: namely, that Mark Williams Co. must be diligent in testing their products.

Let Your Employees Teach Themselves UNIX/XENIX or C.

Self-paced tutorials enable even a novice to quickly learn UNIX/XENIX.

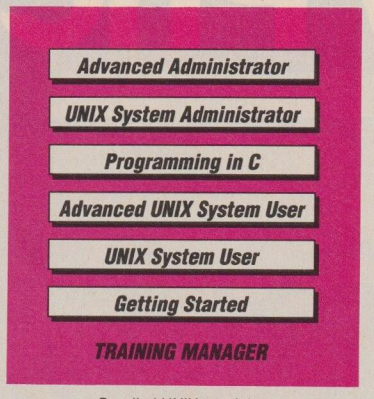
Whether it's a quick overview of basic commands, a refresher course or a comprehensive training program, our self-training software lets your employees teach themselves at their own pace.

Powerful UNIX™/XENIX™ platforms are finding their way into more technical and commercial enterprises with each passing day. But these operating systems are also notoriously complex, requiring much more training than previous systems – expensive training that many companies just can't afford.

Others Have Tried It

"Today's managers are faced with many responsibilities, one of them is making sure you get the biggest bang for your buck." said Tom Reeves. "With CTI's new library of self-pacing training modules we were able to offer everyone in our organization cost-effective UNIX training. CTI's courses helped us maximize our training dollars and dramatically increase our return on investment." (*Root*, 1990)

CTI's LAN version makes courses available to anyone with a PC on the LAN.



Bundled UNIX tutorials.

Call **1-800-736-1936** to receive a free 20-page *UNIX User's Guide to Higher Education.*

CoursewareTechnologies, Inc.
11300 Sorrento Valley Rd., #105
San Diego, CA 92121
(619) 452-UNIX (8649)
FAX: (619) 452-8711
In France: 5 Rue de Rome
93561 ROSNY-sous-Bois
Cedex FRANCE
Tél: (33) 1 48 94 93 39
Fax: (33) 1 48 94 93 40

All courses are also available in French and Italian. Most major credit cards are accepted.
Trademarks subject to trademark claims.

CIRCLE NO. 114 ON INQUIRY CARD

PC Software is Brain Dead, So Why Port it to UNIX?

Dear Editor:

If it is the intent of PC software vendors to simply port their software to UNIX, they can stop now. If I wanted to run PC software, I'd buy a PC. A good example is Lotus 1-2-3, which I recently saw running on a Sun workstation–it's as primitive as Lotus for the PC, yet costs considerably more.

One of the problems of porting PC software to UNIX machines is that PC software is, for the most part, developed with the single-user environment in mind. PC software is limited in "design scope" and relatively unadventurous. If UNIX users sit around waiting for the PC world to develop software for them, I am afraid they will be old and gray by the time they see any decent software run across their desktops.

Even the best selling PC software is brain dead. Every advertisement I have ever seen for Windows 3.0 has that terminal boast scrawled across the bottom: "Breaks the 640K Barrier!" I'll take X Windows over Windows 3.0 any day of the week.

John Michael Wagner
Davis, Calif.

ADDENDUM

In the April 1991 issue of *UNIXWORLD*, WordMarc International was inadvertently excluded from the table of X application developers. The address is 940 E. Meadow Dr., Palo Alto, CA 94303; 415-813-8989. ■

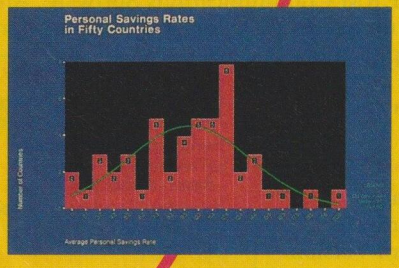
UNIXWORLD welcomes letters to the editor because your opinion matters to us. If you would like to comment on past articles or voice your opinion on an issue, write to us at 444 Castro St., Mountain View, CA 94041, or send us e-mail at either of the following addresses: **uunet!uworld!letters** *or* **letters@uworld.com.**

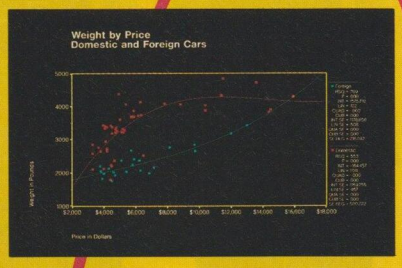
All letters must include an address, and daytime and evening telephone numbers. Postal letters must be signed. We reserve the right to edit letters for clarity and space.

Bend Us. Shape Us. Any Way You Want To.

As long as you love us, it's all right. And love us you will. Statistical software from SPSS is designed to work the way you work. By giving you the power to enter, edit, manage, analyze and present data on virtually every type of PC, workstation, minicomputer and mainframe. By giving you better decision-making ability through the most comprehensive set of statistical procedures available. And by giving you a choice of options to meet your specific data analysis needs. So if you're thinking about statistical software, think about flexibility. Because flexibility means value. And when it comes to value, we top the charts.

The Accessibility of SPSS makes it ideal for beginners and advanced users alike. With its straightforward menus and context-sensitive help and statistical glossary, SPSS gets you started fast. And with the help of our time-saving programming facilities, including macros and a matrix language, you'll have the power to go deeper even faster. And regardless of your experience with statistics, you'll be supported by the documentation and training that's set the industry standard for over 25 years. Documentation that INFOWORLD calls "The Best in the Business."

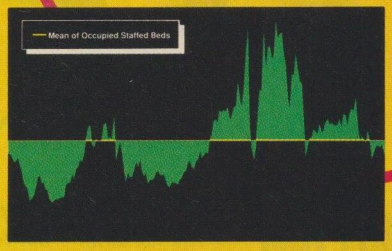




The Statistical Procedures in SPSS give you the power to examine data more thoroughly, revealing patterns that might otherwise go unnoticed. We offer the most in-depth group of statistical procedures available, including univariate and multivariate descriptives, model building, hypothesis testing, clustering and classification, survival analysis, time series and perceptual mapping. No matter what your question, SPSS provides the flexibility to find the answer.

The Data and File Management capabilities of SPSS give you unparalleled flexibility when preparing data for analysis. With SPSS, information can be quickly reorganized, cleaned and transformed, regardless of size or structure. Multiple missing values for nonresponses can be defined and labeled according to your specifications, while built-in controls easily manage information stored in complex file formats, including custom file formats. Self-documenting portable files give you the freedom to move your analysis from one computing environment to the next, saving time and resources. And because SPSS supports most popular microcomputer file types including Lotus,® DBF and SYLK, and offers free interfaces to such leading SQL-based database management systems as Informix,™ ORACLE® and Sybase,™ there's no need to re-enter data or write out intermediate files.

The Choice of Options offered by SPSS provides the flexibility to meet both your immediate and future data analysis needs. Unlike other statistical packages, we give you more than just the ability to choose between the options you may or may not need. We give you a choice of options designed to work together. Options that work as a system, providing the best possible software solution. Options for data entry and editing. Or producing publication-ready tables and reports. Options to analyze the past and help predict the future. Or to present your results with over 40 high-impact color displays, including a variety of charts and maps. No matter what you do, SPSS can help you do it better.



So if you're in the market for statistical software, keep an open mind. Go with the value of SPSS, suppliers of statistical solutions to over 2 million users worldwide. Because when you have the advantage of flexibility, the chances are you'll still be a hit tomorrow.

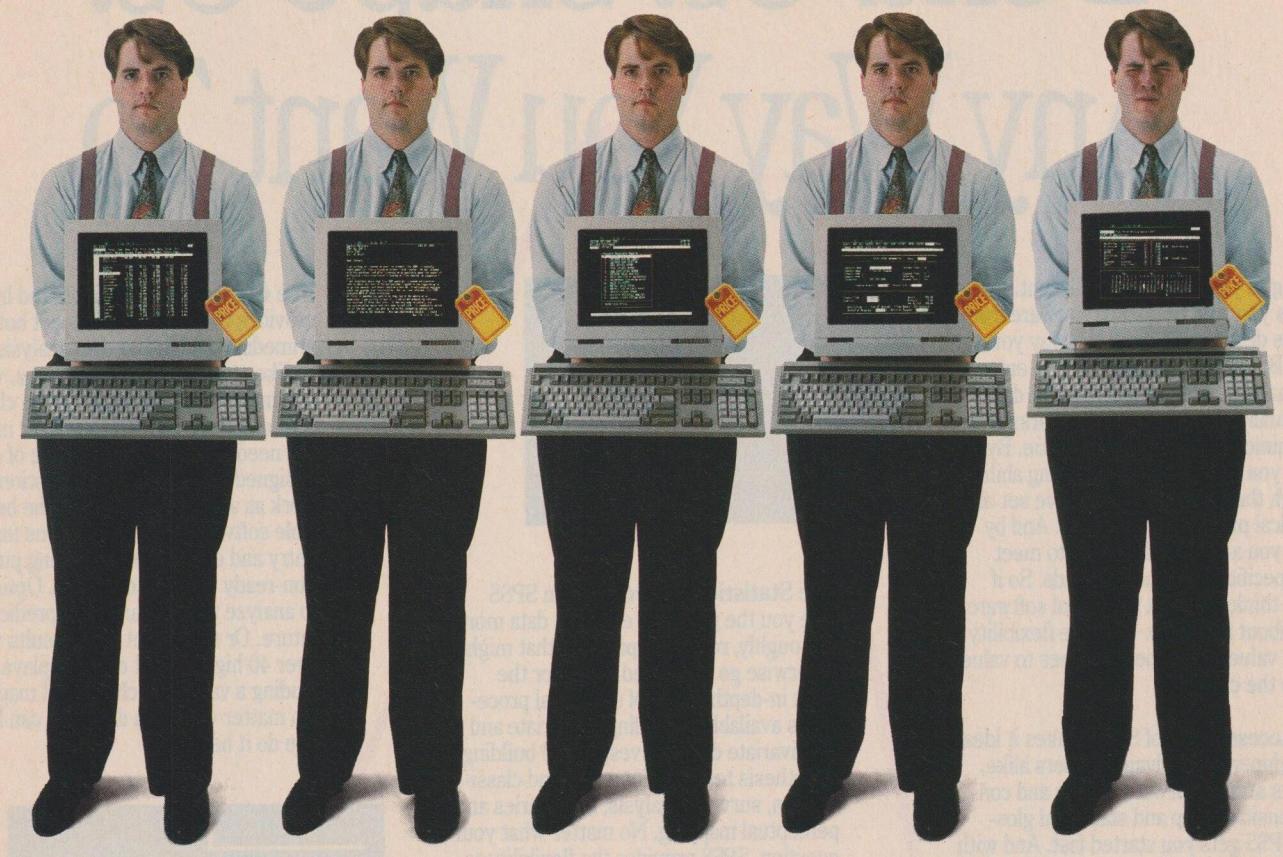
Call 1(800) 457-0121 or FAX (312) 329-3668.

SPSS *We're Making It Easier To Decide.*

Statistical Software For All Leading Computing Environments. Offices in Chicago · Washington, DC · Chertsey, UK · Gorinchem, The Netherlands · Munich · Singapore · Stockholm · Sydney · Tokyo · And Distributors Worldwide

CIRCLE NO. 174 ON INQUIRY CARD

YOU COULD BUY FIVE DUMB TERMINALS.

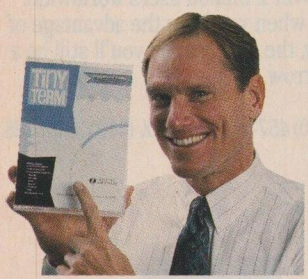


OR ONE SMART TINYTERM.

TinyTERM *There are a number of ways to access a UNIX, VAX or any other multi-user computer. Some of these options can break the bank – not to mention your back. Buying a matched set of terminals used to be the best answer. Today there's a better way. Today there's TinyTERM.*

DOS to UNIX, VAX or Any Multi-User Computer

For a fraction of the cost of a single terminal, *TinyTERM* transforms up to FIVE of your existing PC's to work exactly as if they were Wyse 60, VT220, or SCO Color Console terminals. And *TinyTERM* offers features unavailable on *any* terminal:



WordPerfect to SCO Pro – Instant Hot-key

TinyTERM is exact, memory-resident terminal emulation in the smallest possible space. Hot-key instantly between your locally running application and a different application running on a remote host and back again – and pick up right where you left off.

Multiple Screens – Standard

Ever wish you could open *six* files at once? *TinyTERM* gives you multi-screen support. Open three spreadsheets and three WordPerfect documents, all at once. Edit all six over a single serial line. Finally, you can work to your full potential.

Five-user License = Lowest Cost

TinyTERM's terminal emulations are every bit as powerful as it's big brother – TERM Communications Software. And it's licensed for use on up to five PCs. Keystroke-for-keystroke, dollar-for-dollar, it puts more terminal emulation power at your fingertips than any other software available.

TINYTERM AT A GLANCE

- Exact Terminal Emulation Software:
  - Wyse 60, VT220,SCO ANSI emulations
- Hot-key between local processor and remote host
  - Memory resident (TSR)
- Network and Asynchronous Versions
  - 20+ Networks Supported

For the name of your nearest dealer or distributor, call (801) 268-3088.

Async or Network

TinyTERM even breaks through network barriers. *TinyTERM*'s Network Version runs with your network software to give access to any computers on your network, including support for FTP TCP/IP, Sun PC/NFS, Excelan, Locus PCI, Retix OSI, Ungermann Bass and dozens more. That's smart. That's *TinyTERM*.

CENTURY SOFTWARE
The Access Standard

5284 South 320 West
Suite C134
Salt Lake City, Utah
Phone: (801)268-3088
Facsimile: (801)268-2772

UNITED KINGDOM	FRANCE	FRANCE	SWEDEN	ITALY	AUSTRALIA	MEXICO	GERMANY
Systems Marketing Ltd.	Tauris Data	Top-Log	Edvina AB	ESA Computers	Release4	UnyCorp	Edias Software
Phone: 0488-681004	Phone: (1)30-21-55-05	Phone: (1)42-04-21-18	Phone: 8-83-61-11	Phone: 0541-741113	Phone: (07)831-8666	Phone: (5)543-1168	Phone: (6)122-8004-20

CIRCLE NO. 65 ON INQUIRY CARD

Howard Baldwin

WEITEK'S WAY: TAKE REVENGE

To paraphrase Shakespeare, "Hell hath no fury like a semiconductor house scorned." The semiconductor house in question, Weitek Corp., is best known for its floating-point coprocessors. Sun Microsystems used Weitek's floating-point coprocessors in the SPARCstation 1, 1+, and IPC workstations–but not in the SPARCstation 2. Nevertheless, at the end of April, Weitek officially joined the ranks of SPARC-compatible chip vendors including Fujitsu, Cypress, and LSI Logic, with its SPARC Enhancement Kit, a SPARC chip motherboard.

Industry observers have theorized that part of Sun's strategy of licensing its SPARChitecture is to retain the outside performance boundaries of SPARC processors for themselves. With its W8701 processor, however, Weitek is promising the performance of a SPARCstation 2 at a lower cost per chip. This means that SPARC-compatible vendors that buy Weitek's SPARC Enhancement Kit can now build machines that run as fast as Sun's SPARCstation 2–the one Sun SPARC machine that doesn't use Weitek's floating-point unit.

Weitek says this is the first time that floating-point and integer functions have been integrated on a single SPARC processor on a single chip. Integrating functions on a single chip doesn't necessarily make the chip faster, according to Michael Slater, editor of the *Microprocessor Report*, because it eliminates one chip it reduces the cost, he says.

"Another way to look at it is that they had to do this or risk being cut out of the SPARC business," says Slater, noting that other companies making the integer units already have integration plans in the works. "As a defensive move, this was necessary."

Although analysts don't track specific market share in the narrow realm of floating-point coprocessors, they acknowledge Weitek's current leadership in that segment. Weitek clients include IBM, Silicon Graphics, Hewlett-Packard, Compaq, and Sun. For the floating-point coprocessors it used in the SPARCstation 2, however, Sun went to Texas Instruments. Why? Spokespeople for Sun will only say that TI "could meet Sun's time-to-market and performance requirements" for the SPARCstation 2.

In response, Weitek has done some tweaking on its floating-point unit. The performance numbers it claims for SPARC-compatibles that would use the new chip are, not coincidentally, exactly the same as the SPARCstation 2: 21 SPECmarks and 28.5 mips. "Weitek has revised their [chip] to make it keep up," acknowledges Slater, adding that Sun and TI are working closely on the next generation of the SPARC chip. "There may have been some pressure [on Sun] to use TI."

Weitek representatives profess that, with this move into RISC processor development, revenge for Sun's switch is the furthest thing from their mind. After all, they still sell Sun coprocessors for the SPARCstation 1. They claim their goal with the SPARC Enhancement Set is exactly the same as Sun's when it comes to SPARC. "We are not interested in cannibalizing our Sun business," insists Tim Propeck, vice president of marketing. "We mean to help the market evolve."

Opening the Envelope

In the same breath in which he insists Weitek is not cannibalistic, Propeck admits that Weitek's goal is to deliver

Weitek's SPARC Enhancement Kit includes a 2-D color graphics accelerator and a SPARC processor with integrated floating-point and integer functions.

"technical parity" to other SPARC-compatible vendors. "We're attempting to get them up to parity and then go ahead of the curve."

Weitek is selling the W8701 in quantities of 5,000 in both 33- and 40-MHz versions. The prices for those quantities are $240 and $264 per chip, respectively. The TI 40-MHz floating-point unit found in the SPARCstation 2 sells for $290 in 5,000 unit quantities, Even without adding in the Cypress 40-MHz CPU (Cypress wouldn't quote prices in 5,000-unit quantities), the Weitek integrated chip is less expensive.

Weitek differentiates its chip by claiming that it is the first SPARC microprocessor to be designed by a semiconductor vendor. In the past, the company notes, SPARC CPUs have been "crafted" by Sun and then implemented in silicon by the semiconductor suppliers such as Cypress and LSI Logic.

Weitek contends that the W8701 will benefit its target audience of SPARC-compatible manufacturers in several other ways. First, the chip is "socket-compatible" with the current SPARC integer unit chip. As a result, the board space that would have been taken up by the floating-point unit has been eliminated.

Weitek also claims that at least half of the space on the W8701 is taken up by transistors devoted to floating-point calculations. Given this argument, Weitek could indeed have a crucial headstart over competitors including Cypress, LSI Logic, and TI, in the development of integrated processors. After all, it has more experience in the more complicated ingredient of an integrated chip. As Slater puts it, "It's probably easier for Weitek to add the integer unit than it is for the other companies to add the floating-point unit."

New Graphics Chip

Two chips still come with Weitek's SPARC Enhancement Kit. The second processor, the 25-MHz W8720 IGC (integrated graphics controller), is responsible for accelerating 2-D color graphics. The W8720 incorporates both its own memory and video control. Graphics functions such as polygon drawing, bitblt (bit block-line transfer), and raster operations have been hardwired into the chip. Weitek maintains that by doing this, application speed can increase as much as ten times over using a dumb frame buffer.

The graphics processor will also be incorporated onto an SBus board for sale sometime this summer.

Whether Weitek is motivated by revenge or not, trying to beat Sun at its own game is a pretty gutsy move. It's also savvy for Weitek to make the first move. After all, PCs already integrate the integer unit and the floating-point processor, and the trend is spreading to workstations. It wouldn't be advisable for Weitek to sit back and watch its primary source of income be swallowed up by somebody else's processors. **Weitek, 1060 E. Arques Ave., Sunnyvale, CA 94086; 408-738-8400.** ■

Circle No. 301 On Inquiry Card

Announcing a graphics breakthrough in multiuser computing.

We'll give you the picture.

The same company that you have come to count on for powerful, reliable, multiport controllers will soon be providing the only affordable, high-performance multi-graphics solution. For graphic satisfaction from Maxpeed, call 1-800-877-7998 today.

Maxpeed

Maxpeed Corporation, 1180 Chess Drive, Foster City, CA 94404, fax: (415) 345-6398

CIRCLE NO. 170 ON INQUIRY CARD

Reviewed by Walter Zintz

BOOKS FOR HANDLING USER INTERFACE SCREENS

Command line-driven user interfaces are outdated. Today, most applications with any hope of finding a market need some kind of full-screen interface. For bit-mapped color displays or monochrome alphanumeric monitors, today's users expect screens that are helpful, thorough, and even a bit jazzy. This month's books look at how to program these user interfaces in three environments: OSF/Motif, UNIX, and PC DOS.

Our first two books present the OSF/Motif variant of the high-flying X Window System for bit-mapped displays. The third details handling alphanumeric screens on UNIX systems with the **curses** utility. As a supplement, I review a handbook about setting up the **termcap** and **terminfo** databases on which **curses** depends. The final book deals with the more modest bit-mapped screens found on IBM PCs and clones.

X WINDOW SYSTEM PROGRAMMING

By Nabajyoti Barkakati
Sams; 317-573-2676
750 pages; 34 pages of Index & Contents
ISBN 0-672-22750-9 paperbound; $29.95

This book begins with a brief history of X and then covers how it works. Because it's aimed at programmers, a substantial amount of code is included. The code is more often instructional than appropriate for inserting directly into your own programs. The code is also available on diskette.

Primarily, the author teaches X programming with Xlib, the standard low-level access point for C programs. When he reaches a higher level, he almost always uses Xt intrinsics or the OSF/Motif graphical user interface (GUI).

The unique aspect of this book is that it talks to fluent C programmers–without hand-holding or babytalk–but doesn't presume the slightest previous knowledge of X, nor any substantial experience with windowing. After reading the book, you should know beginning-to-intermediate X programming using the tools described in the book.

Appendixes turn the last quarter of the book into a reference source. They're helpful, but not complete enough to be a substitute for a full-length X manual.

Review Highlights
Technical Level: Advanced to Expert
Understandability: Average
Summary: A good entry point for skilled programmers who are X novices

PROGRAMMING POWER... MOTIF

By Eric F. Johnson and Kevin Reichard
MIS:Press; 800-626-8257 or 503-282-5215
464 pages; 27 pages of Index & Contents
ISBN 1-55828-059-6; $29.95

Johnson and Reichard approach the X Window System at one of its uppermost levels: the OSF/Motif GUI. Although they've written other books teaching X at lower levels, their previous books are not a prerequisite to understanding this one. The only preparation you'll need is a working knowledge of C.

Their refreshing idea is that you can learn to program visual interfaces well without knowing much about how the underlying levels of X operate. That's pretty accurate. Its limitations are basically the same ones you'd find learning a programming language without knowing how your compiler works.

Most of the book shows how to create screen events and other related important matters. It's profusely illustrated with complete code examples and a lesser number of murky screen dumps. Secondary emphasis put is on making your application's interface familiar to users accustomed to Motif.

In place of X internals coverage, the authors provide a practical look at the purposes and methods of window interface design. If you know enough about your own applications to create prompt-line interfaces for them, this book can lead you into designing fairly effective screen interfaces. You won't become an expert on Motif or GUIs, but you will become an effective Motif programmer. The bibliography guides you to plenty of further reading on both Motif and the underlying layers of X.

Review Highlights
Technical Level: Intermediate to Expert
Understandability: Lucid
Summary: Motif by example without the lower layers of X

USING C WITH CURSES, LEX AND YACC: BUILDING A WINDOW SHELL FOR UNIX SYSTEM V

By Axel T. Schreiner
Carl Hanser Verlag & Prentice-Hall; 201-592-2000
257 pages; 17 pages of Index & Contents
ISBN 0-13-932864-5 paperbound; $44.95

Expertise in programming and a passable knowledge of the UNIX programming environment are definitely prerequisites for reading this book. Beyond that, all that's needed is diligent attention. Points are generally explained clearly, but are explained only once.

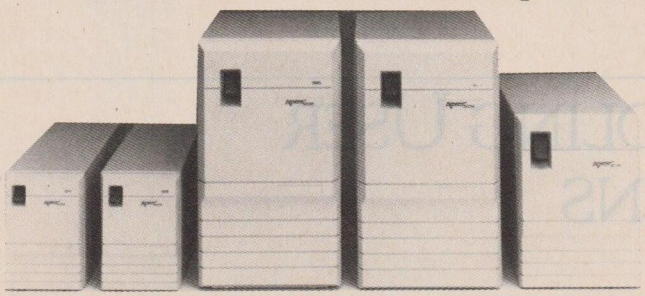
C code makes up at least half of a typical page in this book. Together these fragments make up complete programs for several screen-oriented utilities. They frequently use the three UNIX utilities named in the book's title, but they don't hesitate to call upon other UNIX system resources when appropriate.

The surrounding text is mainly a function-by-function annotation of the code. The reader will learn a surprising amount about **curses**, **lex**, and **yacc** from this ongoing commentary, as well as about UNIX programming.

An appendix contains manual pages for the programs whose usage is not discussed in detail in the text. Source code, presumably in machine-readable form, "may be obtained from the publisher," the author assures us. Unfortunately, he doesn't say which publisher offers it.

continued

UNIX and Emerson UPS
Power Protection from the Expert



Don't let a power failure crash your UNIX or VMS system. With an Emerson UNIX Interface Kit and the Accupower Micro UPS, your data is safe. Each kit includes software which provides a computer running UNIX or VMS with the ability to interface with the Accupower UPS. Upon a power loss the software executes an orderly unattended system shutdown.

Emerson's UNIX Interface kit is designed for SCO UNIX and XENIX, DEC VMS and ULTRIX, IBM AIX, AT&T UNIX, SUN OS, HP-UX and INTERACTIVE.

To protect your UNIX system with and Emerson Accupower Micro UPS and UNIX Interface Kit, call

(800) 876-4303

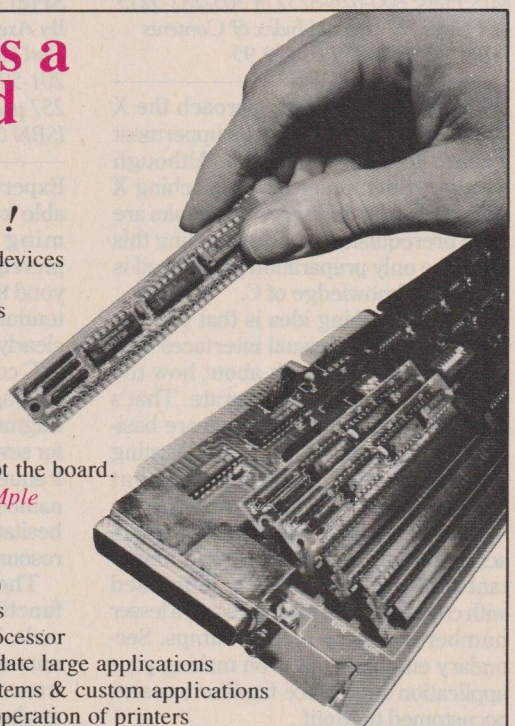
The POWER PLACE, INC.

Computer Power Protection Experts

The above mentioned tradenames are trademarks of their respective owners.
© 1991 Emerson Computer Power, Affiliate of Emerson Electric Co.

CIRCLE NO. 185 ON INQUIRY CARD

What makes a smart board smarter?



SIMMple Flexibility!

Need to operate multiple serial devices with different line interfaces? You need Intellicon Flex8 boards using new SIMM technology.

Adding new equipment? SIMMply field upgrade your board to match the new devices.

Port down and interface the problem? Switch the SIMM, not the board.

That's what we mean by *SIMMple Flexibility* ... and much more:

- high speed communications (up to 38.4K baud on all ports)
- eight asynchronous serial ports
- intelligent communications processor
- multiple boards can accommodate large applications
- support for most operating systems & custom applications
- transparent print (concurrent operation of printers attached to terminals while terminal in use)

Intellicon Flex8 boards from Connect Tech mean expansion without pain in multi-user, multi-tasking computer environments. What could be SIMMpler?

20-340 Woodlawn Road West
Guelph, Ontario, Canada N1H 7K6
(519) 836-1291
Fax (519) 836-4878

Connect Tech Inc.

'Meeting your objectives ... by design.'

Names capitalized above are trademarks or registered trademarks of a variety of companies.

CIRCLE NO. 98 ON INQUIRY CARD

Review Highlights
Technical Level: Advanced to Expert
Understandability: Almost Crystal Clear
Summary: Good advice the hands-on way for skilled programmers

TERMCAP AND TERMINFO

By John Strang, Tim O'Reilly and Linda Mui
O'Reilly & Associates; 800-338-6887, 617-527-1392
248 pages; 26 pages of Index & Contents
ISBN 0-937175-22-4 combbound; $21.95

Because display terminals haven't had even an informal standard since the demise of the "glass Teletype," they now work in as many different ways as hardware engineers have been able to dream up. The two packages in this book's title encode the capabilities and limitations of hundreds of display terminals in machine-readable form, ready for use by any program that must take control of the user's screen. Several hundred capability and limitation topics are included in each of these packages.

The book starts with an explanation of both packages from their beginnings. Advice is also given on reading existing terminal entries, writing new ones, and converting between the two packages. The book comments on how either package interacts with other UNIX programs.

The major segment of this book consists of item-by-item descriptions of the hundreds of capability codes, grouped by similarity of purpose. There are complete explanations, frequent tables and examples, and relevant comments on how differing terminals work.

At the end are four appendixes. The largest one lists capability codes alphabetically, partially duplicating the book's index. Two others discuss access from C programs, and the last lists the capabilities used by the `vi` editor.

Throughout the book, `termcap` and `terminfo` are discussed side by side. This is tedious to the programmer who only needs to understand one of these packages, but a boon to those who (as happens more often) must develop versions of their software for both, or port existing software from one to the other.

Review Highlights
Technical Level: Intermediate to Expert
Understandability: Almost Crystal Clear
Summary: Theory and details of two aggravating packages

continued

INTRODUCING THE SONY NEWS 3250 UNIX LAPTOP. As you can see, it screams. And well it should. At 17 MIPS and 1.8 MFLOPS, it's got enough power to panic the average workstation.

The NEWS®3250 laptop is powered by a 20 MHz MIPS®R3000 RISC processor, plus a floating-point processor. It runs UNIX® System V.4, X Windows® and Motif® software. Offers 8 to 36MB of RAM and a 240 or 406MB internal hard drive. Delivers incredible 1120 x 780 resolution on an 11" backlit LCD monitor.

And, of course, it comes with a full complement of Ethernet®, SCSI, serial and parallel ports.

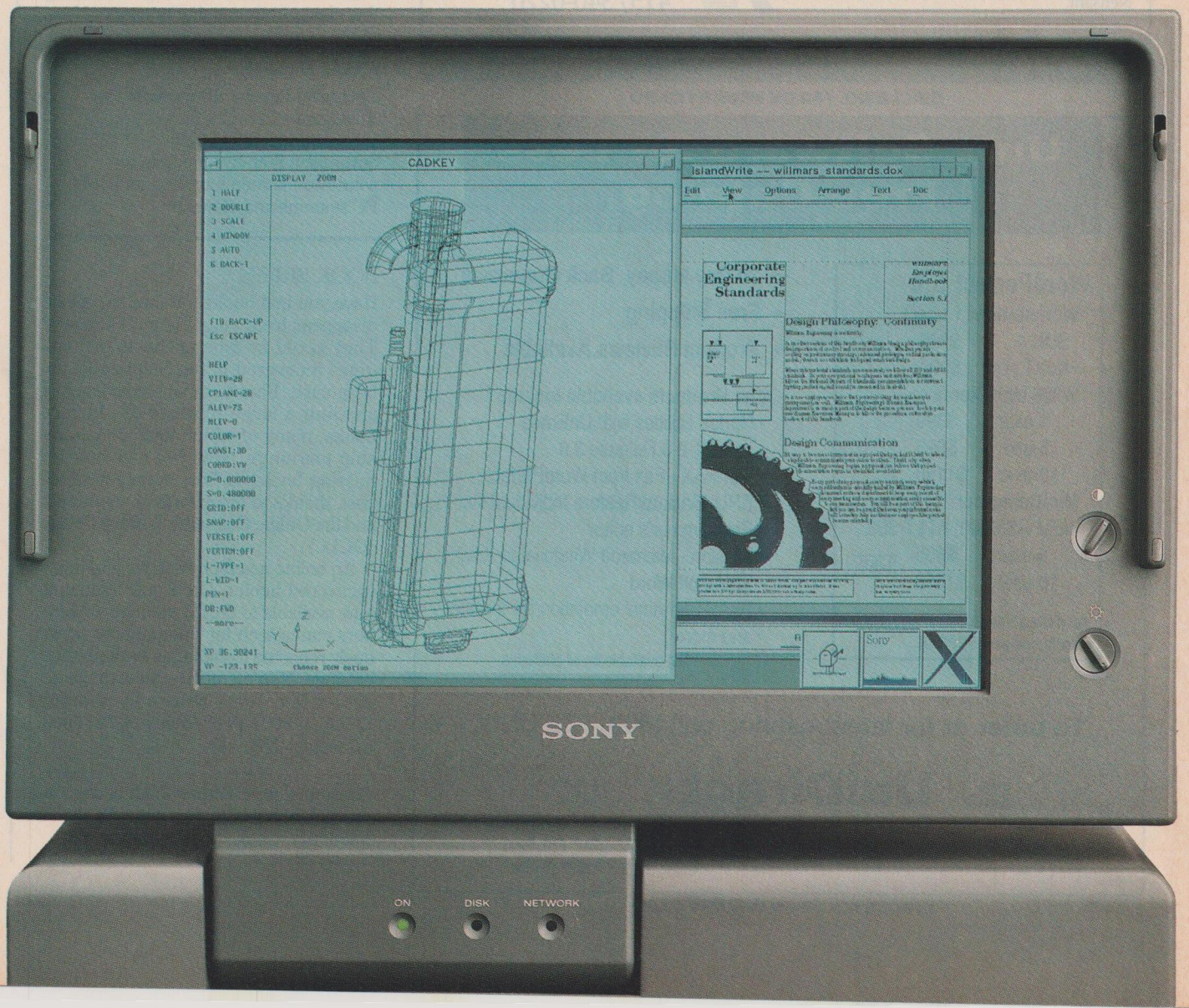
As you may have guessed, this is no ordinary laptop. Like every machine in the Sony NEWS family, it's a full-function desktop workstation. Only smaller.

So check it out. It may scare you at first, but you'll love it once you see it in action. Which you can do by calling 1-800-624-8999, Ext. 96A.

SONY®
Sony Microsystems Company
CIRCLE NO. 228 ON INQUIRY CARD

Eeeeaaaaaah!

Sony Microsystems Company, 645 River Oaks Parkway, San Jose, CA 95134, (408) 434-6644, FAX: 408-954-1057 • Sony of Canada, Ltd., Ontario, Phone: (416) 499-1414, FAX: (416) 497-1774 • Sony Microsystems Europe, Koln, Phone: (0221) 59 78 50, FAX: (0221) 59 35 42 • Sony (Australia) Pty., Ltd., N.S.W., Phone: (02) 887-6666, FAX: (02) 887-4351 • International Sales Division, Tokyo, Phone: (033) 448-4041, FAX: (033) 448-4043. Sony and NEWS are registered trademarks of Sony Corporation. X Window System, Unix, Motif, Ethernet and MIPS are registered trademarks of Massachusetts Institute of Technology, AT&T, Open Software Foundation, Inc., Xerox Corporation, and MIPS Computer Systems, Inc., respectively. ©1991 Sony Corporation of America



Is Your 4GL A Royalty Pain?

Infoflex is Developer Friendly.

Infoflex provides 4GL functionality with a *well* integrated "C" environment. This unique high-low level approach lets you customize applications with code you can come back to. You will also like the consistent WYSIWYG syntax used by all of our modules, and our unlimited runtime license.

Features

Infoflex includes SQL, screens, reports and menus. It also includes features commonly needed but unavailable with other 4GLs such as multi-record screen arrays, on-line table and text help, report query screens, on-screen report viewing, and many others.

Informix Compatible

Infoflex is syntactically very similar to Informix and is compatible with Informix, SCO Integra, C-Isam, D-Isam, and SUN Netisam.

Accounting Anyone?

We sell source code to a full featured accounting system called Accountflex.

Sensible Pricing

We only charge for the first 40 runtimes. After that you are free to distribute as many copies of your application as you like.

UNIX prices:

Developer's	Source	Unlimited
$995	$4,995	$7,500

Available for UNIX, DOS, and VMS.

Call today to order our complete documentation and demo for $75.

INFOFLEX, INC.
875 Mahler Road, Suite #200
Burlingame, CA 94010
415/340-0220

INFORMIX • INTEGRA • NETISAM • D-ISAM COMPATIBLE

CIRCLE NO. 183 ON INQUIRY CARD

Unix Software for Less
Free Catalog

WordPerfect 5.0
Workstation (1 user)
SUN 4 $399
NeXT (1.0) $399
V/386 Unix/Xenix
1-user $399
5-user $895
10-user $1150
MiniComputer
IBM RS/6000, AT&T 3B2
5-user $895 NEW
10-user $1350

An extra $100 off WordPerfect when purchased with VSI*FAX.

- **30 Day Money Back Guarantee**
- **Free Shipping**
- **Product Reviews Available**

Other Products available include *
- Norton Utilities with UnErase
- Lotus 1-2-3 Release 3.0
- VSI*FAX - Fax from WordPerfect
- BRU -Backup/Restore Individual files
- Programmer's editor
- XVision - Microsoft Windows to X link
- Microsoft Word
- BLAST terminal emulation/file transfer
- and more . . .

* Not available on all platforms

To order or for latest catalog call (800) 755-UNIX

UniDirect

UniDirect Corporation, 22995A Mill Creek, Laguna Hills, CA 92653 (714) 581-5966

Unix is a registered trademark of AT&T. All other trademarks belong to their respective holders. Offer good until June 22, 1991

CIRCLE NO. 30 ON INQUIRY CARD

LIBRARY

DESIGNING SCREEN INTERFACES IN C

By James L. Pinson
Yourdon Press (Prentice-Hall); 201-592-2000
267 pages; 13 pages of Index & Contents
ISBN 0-13-201583-8 paperbound; $29.00

IBM PC hardware and software are the environment here. Pinson takes the popular windowing approach to designing screen interfaces. Many of the techniques discussed are generic as the book is not written around a particular function library or compiler. This independence is accomplished by showing the reader how to write every function that will be needed. Samples of these functions constitute most of the code included, which makes up half the book.

The code is fairly well commented as the text usually discusses methods rather than rehashing code line-by-line. As a welcome surprise, Pinson doesn't charge the reader for the code in machine-readable form–an appendix lists independent sources for a diskette or downloading that charge only copying or connect fees.

Review Highlights
Technical Level: Intermediate to Advanced
Understandability: Lucid
Summary: Step-by-step help for windowed screen-handling on IBM PC systems and clones

BOOK BRIEFS

Have you had books too rare to replace disappear from your library's shelves? They could be among the 19,000 volumes recovered in the Stephen Blumberg case. Blumberg was convicted of stealing a large number of old rare books, many of which have no ownership markings. Now you can look for missing books on-line, at very nominal cost, thanks to the efforts of volunteers and the Online Computer Library Center (OCLC).

An online inventory database of those recovered books, The Book Return, is now available to OCLC members. Members can search for titles they've previously reported to OCLC as being in their catalogs. Non-members can arrange access to The Book Return by phoning OCLC at 800-848-5878 or 614-764-6000, extension 4388. ■

Editor-at-Large Walter Zintz is the Advisor Emeritus to Uni-Ops Books in Boonville, Calif.

CONSENSYS V4: $395

UNIX SystemV Rel. 4 Runtime System For 386/486 Systems Unlimited Users Quantity Five Pricing

NEW FEATURES

- The best of BSD and SunOS, including the Berkeley Fast File System, Symbolic Links, Job Control, and VM memory management.
- Complete on-line manual pages.
- A new, comprehensive system administration menu interface.
- XENIX binary and source code compatibility.
- The Korn Shell, STREAMS, and Troff including Postscript output.
- Much, much more.

OPTIONS

C DEVELOPMENT

- ANSI C Compiler
- Sdb Debugger
- Cscope Source Browser
- Lprof Frequency Profiler

NETWORKING

- RFS and NFS
- TCP/IP
- Sockets
- Remote Procedure Call

X-WINDOWS

- X11
- NeWS
- Open Look GUI

CONSENSYS CORPORATION

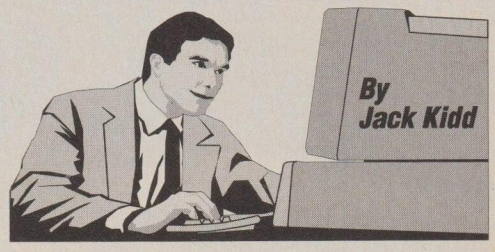
Trademarks/Owner: V4, POWERPORTS, POWERSTOR, QuadCache, HeadMaster, CONSENSYS/ Consensys Corp.; UNIX, Open Look/AT&T Info Systems; XENIX/Microsoft Corp.; SCO, SCO UNIX/The Santa Cruz Operation; SunOS, NeWS/Sun Microsystems

To discuss your requirements for V4, or for any of our other high performance UNIX products, please give us a call.

Phone: 1-800-387-8951
FAX: 1-416-940-2903
Outside USA: 1-416-940-2900

CIRCLE NO. 173 ON INQUIRY CARD

POWER VIEWS



Who is Consensys? Why are They Selling UNIX Licenses? Why Should You Care?

You may already be a customer of Consensys Corp., or have seen their ads in UNIX trade magazines over the past five years. They've built a large and growing following around their **POWERPORTS** line of intelligent multiport cards and their **POWERSTOR** caching disk controller. In the past few months they've released two new products that are already in demand: **HeadMaster**, a disk optimization package for UNIX & XENIX systems; and **QuadCache**, a disk array processor card that supports Level 5 RAID.

System V Rel. 4 is a Better UNIX

Consensys has a UNIX source code license, and uses it in designing and developing their products. The arrival of System V Release 4 provided a unique opportunity for them to enter the market for binary UNIX licenses. Full XENIX compatibility, a large number of important new features not found in SCO UNIX, and standardization with BSD and SunOS make System V Rel. 4 hard to resist. At least Consensys found it hard to resist, so they invested the man-years required to make it a commercial product.

Get Some Real Value Added

If you're in the market for UNIX operating system licenses, you should give these people a call. They're particularly interested in multi-unit opportunities, and they're cutting some great deals --- especially when you can use some of their other UNIX-based products in your systems.

UNIX is becoming a standard product, so why pay a lot of extra money to people who pretend otherwise? Buy V4 instead of SCO UNIX, and put the saving towards a POWERPORTS or QuadCache card that can really improve your system's performance. That's what I call ***value added.***

EPOCH RENAISSANCE: ORDER OUT OF CHAOS.

Only Epoch Renaissance manages all your storage space automatically and transparently, without operator intervention. Renaissance *Migration* integrates every disk into a seamless, centrally managed hierarchy. Renaissance *Archive Servers* provide 20 to 1,000 gigabytes of on-line, low-cost storage. And Renaissance *Recovery* provides on-line backup and disaster recovery for every workstation and server in the network.

epoch systems

For a free 36" x 24" "Order Out of Chaos" poster, call 1(800)U.S.-EPOCH

8 Technology Drive, Westborough, MA 01581 (508) 836-4300 Storage Management for the Network Computer

CIRCLE NO. 229 ON INQUIRY CARD

Omri Serlin

WHAT'S ORACLE DOING WITH MASSIVELY PARALLEL COMPUTING?

Could the latest release of the popular Oracle relational database management system prove to be the salvation of so-called "massively parallel" systems? It's a far-fetched scenario at this point. However, for the first time, the "parallel server" aspects of Oracle Version 6.2 may move these curiosities of the limited scientific arena into the commercial applications marketplace.

A more immediate and practical benefit is that Oracle can now effectively support the most popular loosely coupled system to date: the Digital Equipment Corp. VAXcluster configuration.

Oracle's parallel server architecture finally delivers on promises made when Version 6 was officially launched back in 1988. This architecture permits multiple Oracle instances to share a common database while maintaining full functionality and good performance in a loosely coupled computing environment. The breakthrough technology, according to Oracle, is a clever scheme to manage cache coherence in such environments.

Tightly Coupled Systems Fit Nicely

An Oracle *instance* is a system global area (SGA) and a set of server processes. Redo-logging, archiving, and writing to the database are the primary functions performed by these "front-end" servers. Other database actions, especially reading from buffers or caches in the SGA, are performed by "back-end" servers that are provided by a common, multithreaded chunk of Oracle code incorporated into each user's address space.

The SGA is a section of memory to which all front- and back-end servers must have access. A key element in the SGA is the shared buffer cache. In response to user requests, data blocks containing the requested rows, or records, are brought into the buffer cache where they may remain so subsequent read accesses by any user can be satisfied at memory speeds without having to go back to the disk.

Even when users update rows in cache blocks, the blocks are not flushed immediately to disk. Instead, a terse record of each change is written to the disk-based redo log so that the transaction can be reconstructed in case a failure wipes out the memory buffer. Disk I/O is further minimized by utilizing "group commit," an idea originally employed in IBM's FastPath subset of IMS in which redo log records from many transactions are grouped and written to disk in one I/O operation.

In a heavily loaded system, group commit results in dramatic overall throughput improvement at the cost of minor degradation in the response time experienced by individual transactions. Oracle calls the combination of redo-log and group commit techniques "fast commit."

Fast commit and row-level locking are key performance-enhancing features

Concurrency control to assure transaction integrity in the presence of concurrent updates is achieved through row-level locking. Multiple transactions can update different rows in the same cache block without having to lock each other out, as would be the case if block-level locking (or, worse still, table-level locking) was used.

Shared buffer cache, fast commit, and row-level locking are the key Oracle performance-enhancing features. Maintaining these advantages in any new implementation, especially on multiprocessor systems, was a key Oracle goal.

The basic Oracle architecture is very well-suited for implementation on a class of multiprocessor configurations known as "tightly coupled" systems. In such systems, all processors have read, write, and execute access to a common memory system, most often via a common bus. By keeping the SGA in the shared memory, and distributing the front- and back-end processes to the multiple processors, significant performance gains are attained while the basic Oracle structure remains essentially intact.

Ownership Key to Solving the Loosely Coupled Puzzle

However, implementing the Oracle architecture–or any other database system originally developed for uniprocessor environments–on loosely coupled systems is a horse of a different color. In this situation, each processor node is equipped with a private memory system over which it has exclusive control. Communication between these processor-memory nodes takes place not through shared memory, but via some sort of a communication link. In the most popular example of a loosely coupled system, the DEC VAXcluster, this link is the "star coupler"–logically a duplexed, 70-megabit per second common bus. A device called the Hierarchical Storage Controller (HSC) also connects to the star coupler to allow all nodes to share a set of common disks.

To fit this environment without developing a new database concept from scratch, and without giving up the key performance features of Version 6, there had to be a way to allow multiple instances of Oracle, one per node, to share access to a common database. While the HSC made this physically possible, there remained the tricky question of how to allow each instance to retain its shared buffer cache while ensuring that all the caches remained coherent.

Cache coherence is a well-known problem. It is originally encountered at the hardware level in tightly coupled systems in which each processor usually has its own cache. As the multiple processors access main memory, copies of

the same cache blocks may show up in multiple caches. If any processor modifies one of those copies, other existing copies will no longer reflect the most current state of that data block and a cache "incoherence" is said to exist.

While there are numerous clever solutions to this problem, they are all essentially variations of the concept of ownership: each data block is owned by a given processor, or unowned if no cache copies exist as yet. Before a processor can update a block, it must first secure the ownership over that block.

This is essentially the technique adopted in Oracle Version 6.2. As blocks of data are initially requested by users on a particular node, for example node 1, temporary ownership over those blocks is granted to node 1. If the request is for read access, the ownership is not exclusive: other nodes may access the same block to read as well. Thus, multiple users within a node, as well as within multiple nodes, can read the same block concurrently.

If a user wished to update a row in a cached block on node 1, the node must have first obtained an exclusive lock on that block. Following the update, the block remains in node 1's cache. Other node 1 users may update the same block as in Version 6 and the redo log, fast commit, and row-level locking are all retained on each node.

Should another user on another node wish to update a row in a block owned exclusively by node 1, it must first request node 1 to transfer exclusive ownership to itself. Before granting this, node 1 will flush the cached block to disk, and node 2 will read the latest version of the data block from the disk.

Interestingly, other copies of the same block that exist in other nodes are not necessarily invalidated. Oracle supports the concept of multiversion read consistency, under which old versions of blocks can still be used to satisfy ongoing queries, provided such queries were launched prior to the latest update of the block in question.

How do the nodes communicate with each other to negotiate ownership rights? In the VAXcluster environment, Oracle relies on a standard DEC feature called the Distributed Lock Manager (DLM). It is a clever scheme for establishing unambiguous usage rights over distributed resources without resorting to a central directory or master node concept.

The functionality provided by DLM includes the ability to deduce from the name of a resource the node responsible for keeping track of the usage of that resource. This is achieved by a hashing formula that takes into account the number of nodes in the cluster. Should there be a reconfiguration (due to a failure of a node, or the addition of a node), the DLM employs a scheme by which the responsibility for keeping track of resource use is redistributed among the reconfigured nodes.

A glowing report on Version 6.2 comes from ITT Hartford Insurance, which betatested the product for a week on a cluster consisting of two VAX 6400 systems. According to James Bosco, a systems consultant at Hartford, the test showed that a major claims processing application

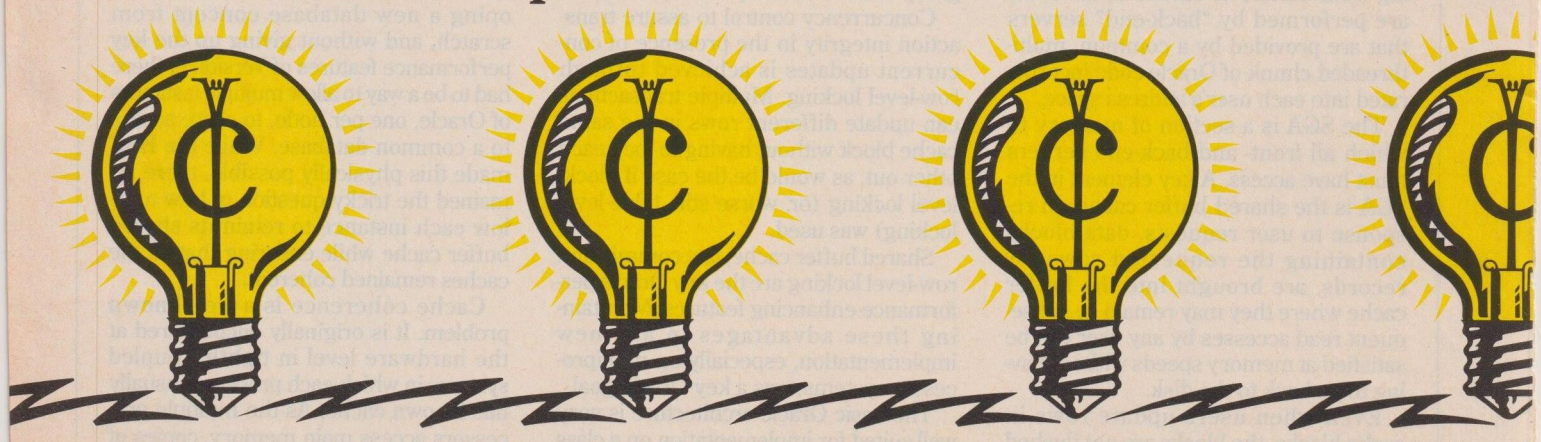
Dial-Up Internetworking. The Most Cost-Effective Connection For Your Enterprise.

Conventional internetworking lets you connect widely-separated workgroups into a single, enterprise-wide network. But only at a very expensive price.

Which is why we believe Dial-Up Internetworking is an idea whose time has come.

Dial-Up Internetworking is the most cost-effective way to extend your enterprise network to the smaller, remote workgroups that comprise the bulk of the internetworking market. It uses the general switched telephone network, limiting the need for the high-performance T-1 lines and high-speed routers that drive up conventional internetworking costs.

Dial-Up Internetworking is made practical by another Telebit® first – a powerful automated dial-up router called NetBlazer. NetBlazer provides low-cost



and a master data application, which previously used two separate databases and required the SQL*net networking interconnect, could now use a single unified database. Furthermore, Version 6.0 entailed a per-transaction overhead of 35 to 50 seconds, but using Version 6.2 with the parallel server feature dramatically reduced that overhead to around 10 seconds.

The Oracle-NCube Connection

What does all this have to do with massively parallel systems? As it happens, several such systems are simply instances of loosely coupled systems that differ from the VAXcluster in two relatively insignificant areas: they have many more processor nodes, and they use an interconnect network that provides full logical connectivity between all nodes while utilizing a much smaller set of physical connections. The hypercube architecture is a prime example of such loosely coupled, massively parallel system.

Oracle is working closely with Ncube to adopt Version 6.2 to that configuration. Like all other suppliers of massively parallel systems, Ncube is a young, struggling company with a product that appeals to a very narrow audience of experimenters in the National Labs, universities, and other scientific and technical research facilities.

Quite a few technical problems must be solved before Version 6.2 can be truly effective on an Ncube or other hypercube. Because the individual Ncube processors run a proprietary monitor, it is necessary to port Oracle to that monitor or port UNIX to run on the nodes.

Moreover, the useful functionality of the VAXcluster DLM must be redeveloped and reimplemented on the Ncube–an effort that is now in progress. Beyond that, the Oracle development tools and ancillary products will have to be ported to the Ncube to make a complete offering.

Other obstacles include the relatively low power of the Ncube proprietary processors rated at 7.5 mips, and the relatively small amount of memory each processor can have–16 megabytes at this time. Only certain nodes have direct access to disk, and thus, only those nodes would be adequate to support Oracle instances although, in principle, applications and tools could run on more remote nodes.

These and other uncertainties will keep this project in the experimental category for the next two years or so. Larry Ellison, Oracle's CEO, is so convinced of the market potential of this combination that he has a personal investment in Ncube. Interestingly, Ncube recently relocated most of its operations to Belmont, Calif. where it occupies offices previously used by Oracle.

While many questions remain, it is very likely that a successful porting of Oracle to Ncube will not only open up potentially large new markets for Ncube, but will point to a possible way out for other struggling massively parallel system suppliers. ■

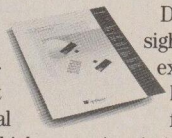
Editor-at-Large Omri Serlin heads ITOM International Co., a consulting and research firm based in Los Altos, Calif.

WAN capability on TCP/IP networks, supporting dial-up lines. It's the first product to combine the full suite of open systems standards in high-speed modems with those of TCP/IP internetworking.

NetBlazer uses the complete Telebit family of high-performance modems to connect remote locations in your organization together in a virtual wide area network, giving remote users transparent access to all network computing resources at a far lower cost than is possible with conventional internetworking technology. It complements the high-speed routers that move information over the corporate backbone.

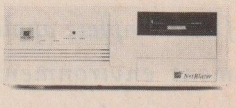
Additionally, NetBlazer acts as a terminal server or modem pool. It can route Ethernet to Ethernet. And can even use 56K leased lines.

WAN IP routing over dial-up is incredibly fast, thanks to NetBlazer's support for standard SLIP and PPP protocols combined with advanced techniques like TCP/IP header compression.



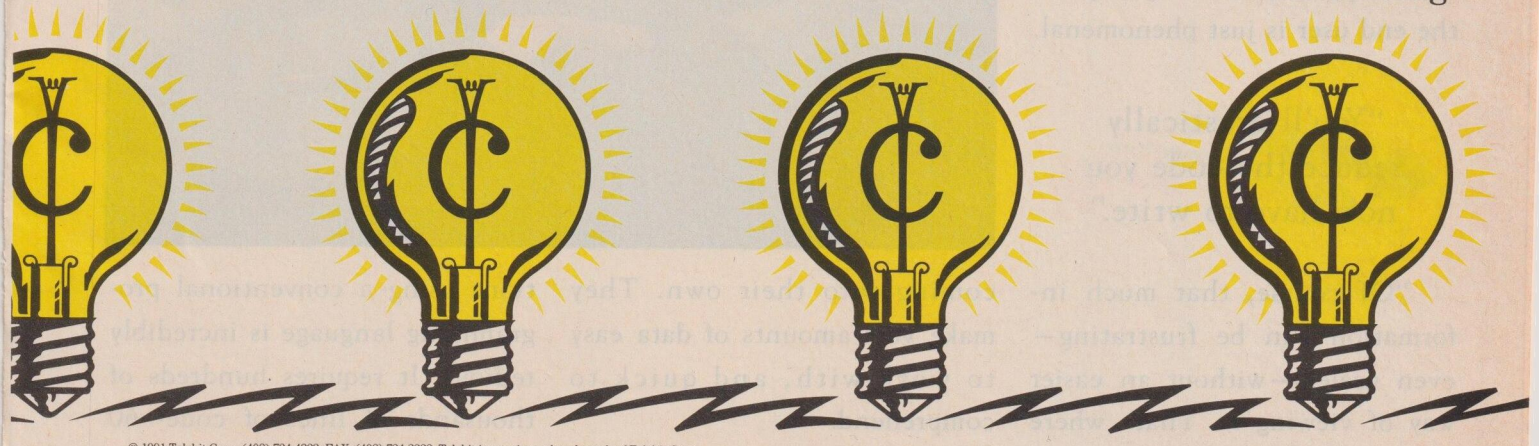
Dial-Up Internetworking is the kind of clear-sighted advance our customers have come to expect from Telebit. We've become the leader in high-speed, dial-up modems by delivering faster, more robust and reliable performance in mission-critical applications.

Call 1-800-TELEBIT for free information on NetBlazer. And find out why Dial-Up Internetworking is the most cost-effective connection your enterprise can make.



TELEBIT®

First in Dial-Up Internetworking.



© 1991 Telebit Corp. (408) 734-4333. FAX: (408) 734-3333. Telebit is a registered trademark of Telebit Corp.

CIRCLE NO. 215 ON INQUIRY CARD

SANDRA KURTZIG, CEO OF ASK COMPUTER SYSTEMS:

"If GUI application developers could be ten times more productive, what would that do for client-server computing? We're about to find out."

In December, 1990, ASK Computer Systems acquired Ingres, the acclaimed manufacturer of intelligent relational database products. Here, CEO Sandy Kurtzig discusses the dramatic productivity increases reported by developers using INGRES/Windows 4GL, the first complete application development environment for graphical user interfaces:

"I don't see how anyone can keep from getting as excited as we are about client-server computing. The amount of information it puts at the fingertips of the end user is just phenomenal.

"You'll drastically reduce the code you now have to write."

"Of course, that much information can be frustrating—even useless—without an easier way of viewing it. That's where graphical user interfaces are coming into their own. They make vast amounts of data easy to work with, and quick to comprehend.

"But writing GUI applications using a conventional programming language is incredibly tedious. It requires hundreds of thousands of lines of code—60 percent of which do nothing but

produce the GUI itself. Add that to the problems of accessing data from multiple sources, a shortage of developers, and a steep learning curve for existing GUI tools, and you're talking a huge investment of time and money. No wonder client-server applications have been so slow in coming.

"A product that makes programmers up to ten times more productive."

"Well, all that's going to change once developers get their hands on INGRES/Windows 4GL—a tool that helps programmers be up to ten times more productive. At least, that's what some of our customers tell us.

"For starters, INGRES/Windows 4GL allows you to use a mouse to interactively build windows and menus without writing a line of code. Then you assign functions to those components using a very elegant fourth generation language, which a good 3GL programmer can learn in a week or less.

"So, applications that once required thousands of lines of code now take far fewer.

"Unlike simple screen painters and HyperCard-like tools, INGRES/Windows 4GL is designed for full-scale production applications. It helps you manage and coordinate multiple development teams. It even tracks different versions of your applications throughout the company. No wonder it's now being used to create sophisticated applications like shop floor control and critical care medical systems.

"Portability is one of this tool's most profound breakthroughs. An application you create in, say, OSF/Motif will be able to run flawlessly on Windows 3.0, Open Look and other popular systems. With the appropriate look-and-feel in each environment. With full interoperability with other applications. And with no rewriting.

"Your applications will also link seamlessly to the whole range of Ingres products, and—thanks to INGRES/Gateways—to other leading databases.

"Think about it: Client-server applications with GUIs and full portability, in a fraction of the time. This could be the product that finally opens up the workstation for mainstream commercial applications.

"I think it's fair to call it revolutionary."

INGRES/Windows 4GL supports Sun SPARC, DEC VAXstation/VMS, DECstation/ULTRIX, HP 9000, IBM RS/6000, and other major workstation platforms. To learn more about INGRES/Windows 4GL, call 1-800-4-INGRES.

Ingres

In December, 1990, Ingres Corporation was acquired by ASK. For more than ten years, Ingres has been a worldwide technology leader in database management systems. The family of Ingres products includes: the first intelligent relational database; the first Windows 4GL development toolset; gateways to the most popular non-Ingres systems; powerful desktop solutions; and global customer support. Ingres' reputation for technological excellence was most recently confirmed by Digital Review—the magazine's 1990 Editor's Choice, Best Database Management Software, and Best Database Tools awards went to Ingres—as did the Sun Observers' excellence award for Best Database Management System.

ASK

SOLUTIONS AT WORK

©1991 ASK Computer Systems, Inc., 2440 W. El Camino Real, Mountain View, CA 94039. ASK is a registered trademark of ASK Computer Systems, Inc.
Ingres, Ingres/Windows 4GL and Ingres/Gateways are trademarks of Ingres Corporation. All other brands and trademarks are the property of their respective holders.

GA642W

CIRCLE NO. 91 ON INQUIRY CARD

3270/X

The First 3270-Coax for UNIX & XENIX!

LYNXWARE
LYNXWARE
LYNXWARE
LYNXWARE™

IBM SAA/SNA Data Communications Products for Unix Environments

LYNX 3270/X is an OSF/Motif-compliant 3270 terminal emulator for SCO's Open Desktop that provides "point and click" access to 3270 host sessions in multiple windows.

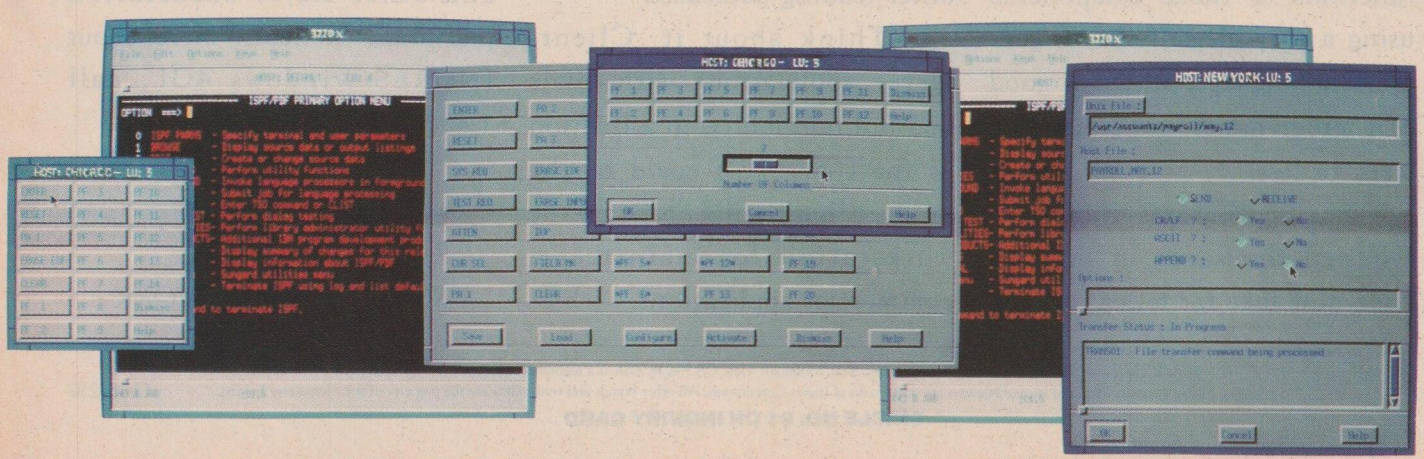
Users can initiate and monitor IND$FILE File Transfers, cut and paste data between windows, create custom graphical keypads, and summon many other features that increase flexibility and productivity.

When installed on a TCP/IP LAN, LYNX 3270/X offers host access to all X11-compatible workstations and terminals.

Current host connection options include SDLC, X.25, and DFT. Product installation is a snap, and configuration and administration are entirely menu driven.

LYNX SOFTWARE
A WORLD-WIDE TECHNOLOGY COMPANY

259 Radnor-Chester Rd., Suite 120
Radnor, PA 19087
Telephone: (800) 336-LYNX (215) 964-1183
Fax: (215) 964-8724
E-mail: uunet!lynxwwt!info



OSF™ & MOTIF™ trademarks of Open Software Foundation, Inc. UNIX® trademark of AT&T. IBM® trademark of IBM Corp. SCO™ & Open Desktop™ trademarks of Santa Cruz Operation, Inc.

CIRCLE NO. 153 ON INQUIRY CARD

THIS BUD'S FOR USERS

By Gary Andrew Poole

In the summer of 1966, Elbert W. "Bud" Huber Jr., now chairman of the User Alliance for Open Systems, was far away from the event that would change his life. Huber was a 20-year-old University of Texas student working off the California coast as a midshipman. The event occurred on the Austin, Texas campus on an August morning with a clear chalky-blue sky and the temperature climbing toward the low 100s.

Charles Whitman, an ex-Scoutmaster with excellent grades in the University of Texas' architectural engineering program, violently disrupted the calm summer day. Whitman took his arsenal of guns and ascended the University's white Gothic tower. He shot six people before he reached the observation deck. A river of blood ran down the staircase.

Whitman then opened fire on the campus courtyard turning the next 90 minutes into a massive slaughter, killing 13 people and wounding 31.

When Huber returned to the University after summer break, he went to the plaza where he used to walk. He looked at the bullet holes littering the walls. He imagined the burgundy-colored blood that had soaked the ground. It was the first time he noticed *the words* inscribed across the entrance to the Tower.

Bud Huber has trouble retelling this memory from his youth. It seems wedged into his soul like an elusive thorn. He is now 46 years old and exhausted from overworking. You can see it in his weary face and in the way he slumps on the couch as he talks. His eyes look toward the ceiling.

"I've never shared this with anyone..." he says, almost whispering. "Those words across the entrance to the tower, *those words*–'Ye shall know the truth, and the truth shall set you free'–there was some kind of metaphor, and it consumed me."

In 1966 when Huber looked at that message, he collapsed. He fell to his knees and wept. "I don't know what it was," he recalls, "but when I saw those

SCOTT ORAZEM

"The environment, crime, the homeless, AIDS, war, economic disruption can all be brought into perspective if we can share information."

—Bud Huber,
chairman of the User Alliance for Open Systems

SPARClones
From $4495
(Complete with Software)

First Computer's SPARClones™ can't be beat. From boards that'll turn your VGA-equipped 286/386/486 into a full-blown workstation that's 100% compatible with the Sun Microsystems SPARC family, to full-blown SPARC-compatible workstations. All delivered with the fully licensed SunOS™ UNIX™ operating system combination and one year of free maintenance. First SPARClones give you everything you want in a Sun SPARCstation ... except the price.

FOR $158.22/MONTH, TURN YOUR PC INTO A 15.8 MIPS SPARC SunOS/MS-DOS SYSTEM.

If you have a VGA-based 286/386/486 MS-DOS system, just plug in our $4495 SPARClone/PC board, partition your hard drive and install the full SunOS/UNIX combination software, included with 8MB RAM, onboard Ethernet, two SBUS expansion slots, simultaneous SunOS/DOS operation and file transfer.

FOR $263.82/MONTH, POWER UP YOUR OWN 15.8 MIPS SPARClone1 WORKSTATION.

Our SPARClone1 is 100% software compatible with the Sun Microsystems SPARCstation family, yet offers double the memory, more peripheral space and a bigger power supply. Configure your Sun system, take their list prices, subtract 33% and then call us. For example, included in our $263.82/month price is full software, **16MB of memory**, a 19-inch mono monitor, a 3.5" floppy drive, a 207MB hard disk *and* one full year of maintenance. Exclude the hard disk and our SPARClone1 comes in for $6495, or 228.62/month.

FOR $281.42/MONTH YOU CAN SIZZLE WITH OUR 28.5 MIPS SPARClone2. OR OWN IT FOR UNDER $8000! CALL TOLL FREE TODAY.

1-800-783-3180
(or 1-508-757-2840)

FIRST COMPUTER
CONSULTANTS

©1991 by First Computer Consultants. SPARClone is a trademark of First Computer, not to be confused with SPARC, a trademark of SPARC International. Sun, SunOS, SunView and SBUS are trademarks of Sun Microsystems. UNIX is a trademark of AT&T. TRBA

CIRCLE NO. 10 ON INQUIRY CARD

words something happened in my mind."

"If you print this people are going to say I'm crazy, but it is a visceral understanding to me that is unshakeable," he says. "The environment, crime, the homeless, AIDS, war, economic disruption can all be brought into perspective if we can share information."

Bud Huber's idea of Elysium is a place where people have access to timely, accurate, and reliable sources of information. "I would like our energy placed in sharing what we know," he says. "We're in this together whether we like it or not."

Chairing the User Alliance

As the chairman of the User Alliance for Open Systems, Huber is trying to do just that. The User Alliance is composed of management information systems (MIS) directors from large companies including Exxon, Ford, General Electric, General Motors, Kodak, McDonnell Douglas, Boeing, and Hughes.

It started in the fall of 1989 when a group of managers (Huber is a senior consultant at Hughes) began calling each other to talk about their technical problems and their desire for open systems. Huber was one of the key organizers when 17 of these MIS people came to Atlanta, Ga., in February 1990.

In Atlanta they identified nine barriers to achieving open systems–lacking a process, lacking a vehicle, legacy systems and culture, insufficient open systems, tactical vs. strategic planning, nonlinkage to business case, competing intra-enterprise interests, no North American vision, and no shared vision–and set out to break them. In May 1990, in Houston, Texas, 30 users refined these barriers and defined 10 action items to overcome them. In September 1990, in Warren, Mich., the "Houston 30" became the User Alliance for Open Systems and partnered with the Corporation for Open Systems International.

Huber says the User Alliance has had difficulty dispelling the image that it is a group against vendors. He says he wants to develop "partnerships" with vendors "to accomplish common business goals."

"Today people are held hostage to proprietary systems, which don't allow them to get to their data," Huber says. "I'm doing everything I can to free that up."

"I am unshakeable in my belief that open systems is a path that allows people [to get information]," he says. "Ultimately this will happen on a national scale. Technology issues are not holding us back, it's vision."

Huber was approached about becoming the chairman of the User Alliance in early 1990 to help fulfill this goal. "Everyone recognized that he has the vision," says Catherine Howells, manager of computing standards for Boeing Computer Services and a member of the User Alliance executive committee.

Vision. Even his 71-year-old mother uses that word to describe Huber. "He's a visionary," drawls Maxine Huber from

Technology issues are not holding us back, says Huber, it's vision

her home in Pearland, Texas, a suburb outside of Houston. She also describes her son as a "maverick" who has always flowed and fought with mainstream ideas.

"Bud doesn't like me to tell this story," she says, "but he applied to the Naval Academy in Annapolis once." Huber received an appointment, and then turned it down because he wanted more freedom. "We were appalled," says his mother. Yet, after he graduated from the University of Texas with a bachelor's degree in mathematics, he joined the Navy in 1968 and stayed in until 1979. He became a lieutenant commander and worked as an intelligence specialist for national-level submarine security programs.

Huber also ran for the Long Beach (Calif.) City Council in 1986 and for mayor of Long Beach in 1988, a "futile attempt," says a *Los Angeles Times* reporter who wishes to remain anonymous. "He's a conscientious and respected leader, although some people think he's overzealous," says the reporter.

Open Systems and Discrimination

Although Huber ran for city council and mayoral seats as the president of the affluent Belmont Shore Improvement Association, he has always sided with the underprivileged and those facing discrimination, he says. Huber says he has faced discrimination because he is openly gay.

"I understand the pain that people go through," he says. "When they go to the social security system and they're de-

How You Operate Your Network Is Your Business.

How Your Network Operates Is Ours.

Networked AT&T Systems From ERI.

Productive networking is our business. We perform analysis, design, systems configuration, integration, installation, network management, support, training and maintenance to ensure peak system performance for Fortune 500 companies nationwide:

- Connectivity from ERI includes the WGS computer system family from AT&T. We recommend AT&T's most powerful desktop workstations such as the 6386/25 WGS, the flexible 6386 SX/EL, and the affordably versatile 6286. And for these state-of-the-art systems, we design connectivity solutions supported by AT&T's StarGROUP LAN Manager Server Version 3.4.
- ERI University instructors use the UNIX-based AT&T StarServer Group i486 to train MS-DOS-users to achieve maximum productivity in their native mode. They learn to leverage the power of UNIX, while accessing multiple operating systems.
- In a network designed by ERI's Systems Engineers, Novell NetWare supports client/server applications, multi-station linkages and remote connectivity – without compromising the highest security standards.

Making your business more productive is ERI's business. That's why we're the nation's leader in AT&T networked computing solutions. Call us today at (800) 222-1050. Ask for Dept. I.

ERI™

Answering your needs today.
Anticipating your needs for tomorrow.

Corporate Headquarters: 180 Vanderbilt Motor Parkway, Hauppauge, NY 11788-9682
(800) 222-1050 Fax (516) 435-0995

All names, products and services mentioned are the trademarks or registered trademarks of their respective organizations.

nied benefits. When the system breaks down and the clerk doesn't apologize, he just says 'Jeez, you didn't get your check this week.' That means those people don't get food on the table because of the computer system. It's a waste, a mind is a terrible thing to waste," he says, his voice trailing off.

Huber didn't grow up in an academic or affluent household. His father was a welder and his mother a secretary, but Huber was "very studious," according to his mother. His father died two years ago.

"When he was in junior high school he would go to the library and check out engineering books," Maxine Huber says.

"One time we had guests over and we were all sitting at the table. I said something and heard this little voice saying, 'No! You're wrong!' Well, Bud was eavesdropping with some wires," she says laughing.

Huber always had an interest in electrical engineering, but it was his first job in 1962 at American General Life Insurance that provided him with formal computer training. Huber worked in the mail room at American General's headquarters in Houston when a high-level manager–R.H. "Bob" Ellis–noticed Huber in the elevator and told him to come to his office. For no apparent reason, Ellis talked with Huber and then decided to send him to IBM training school to learn about computers. Huber was shocked.

"If he's alive he probably doesn't know me from anybody," Huber says, "but he saw something in me. One outgrowth of this event has caused me to appreciate what very simple acts for others can do. If there's ever a legacy of what my life is, it's caring enough to help others."

An Inner Flame

After American General, college, and the Navy, Huber took a job at Hughes Aircraft in 1979 as a computing specialist. Carl Reynolds, retired staff vice president of communications and data processing for Hughes, was responsible for hiring Huber. Reynolds describes Huber as a patient person who becomes "vocal in the heat of battle."

Other colleagues concur. "He's not dogmatic," says Nina Lytton, editor of the *Open Systems Advisor.* "He's a prince, a natural leader."

"I couldn't do what he does," adds Boeing's Howells. "He's a good listener, very tactful. He has physical energy and real passion."

Huber's intense schedule and drive have forced him toward physical exhaustion, but his "inner flame" makes him carry on, he says. Huber credits much of his drive to his father. "There was something I said at his funeral," he says. "He crafted with his hands and molded with his heart. In my mind that's how I work."

Huber says he has always been close to his parents. In fact, Maxine Huber wishes her son would move closer to her home. "It's just great when Bud comes home, it's wonderful...time's passing just now," she says, sounding tired like her son.

"This [interview] has taken a strange turn," he says sadly, looking at his watch and then toward the ceiling. "I don't know... I'm driven, I really am." ■

UNIX WORLD
Product Of The Month-APRIL 1991

Double VISION

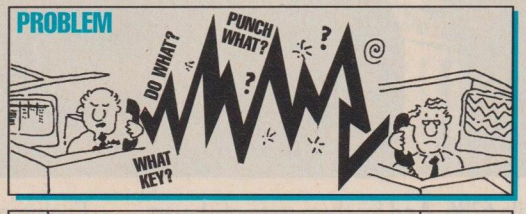
Access And Control Any Terminal, Anywhere, Without Leaving Your Seat.

Finally, a software product for Unix that allows you to be in two places at once!

Double VISION™ is a revolutionary new product that allows you to "attach" to another terminal. Once attached, your screen instantly appears exactly like the terminal you're attached to. Better still, you have complete control of the remote terminal's keyboard. In a flash you can see the exact cause of a problem and issue the command or keystrokes to correct it--all while the troubled user sits back and watches!

Have a mysterious problem that appears only when you're not watching? With Double VISION'S Recorder Option, you can record all activity on a user's terminal for a specified period of time and play it back later keystroke for keystroke. You can see exactly what keys were pressed and determine immediately the cause of the problem. *Bottom line?*

Double VISION Puts Things In Perfect Focus!



Need to connect multiple terminals to your terminal to give first hand instruction to many users at once? With Double VISION'S Training Option, you can quickly attach multiple users--local or remote--to your terminal and allow them to watch everything on your screen. Stop using blackboards and overhead projectors for training. Get into the 1990's with Double VISION!

Go ahead, do yourself a favor and stop muttering "#*!@!!" and start exclaiming "I see exactly what you mean!"

For More Information
800-582-9337

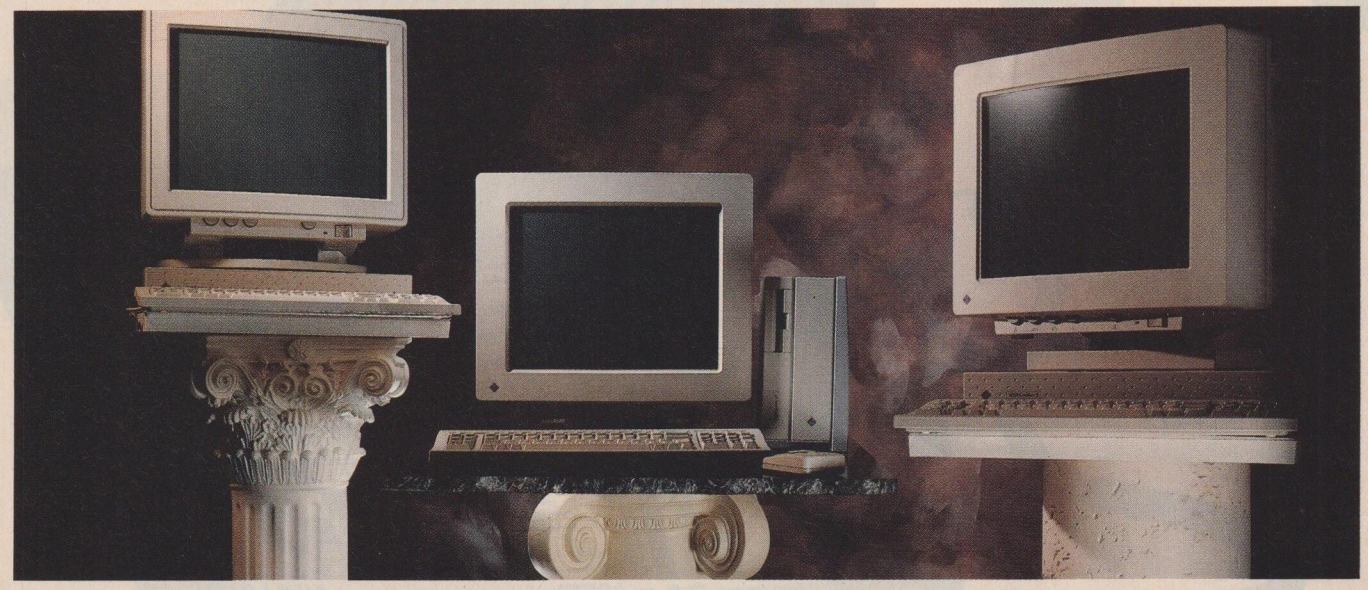
MaxTech

Interactive UNIX™, AT&T UNIX™, and AIX™ versions available soon. Double VISION is a trademark of MaxTech. All other names are trademarks of their respective manufacturers. uunet!maxtech!dvinfo

CIRCLE NO. 8 ON INQUIRY CARD

The Most Advanced Network Solutions On The Most Powerful Workstations.

Networked Sun Systems From ERI.



Sun's SPARCstation IPC and ERI's expertise are an unmatched combination for powerful networking capabilities. The IPC delivers high processing power, large disk capacity and expansion capabilities that meet the needs of the most demanding users. With up to 24MB of RAM, an MS-DOS compatible floppy disk drive, choice of color or monochrome displays, and both internal and external disk capacity, the IPC offers the perfect balance between maximum performance and affordability.

Sun users benefit from the power of UNIX for multi-tasking, connectivity to PCs and mainframes; easy-to-use menu-driven applications; multimedia capabilities; and simple transfer of files, data, and applications. With Sun SPARCstations you also get complete compatibility with over 2,100 SPARCware applications, including Lotus 1-2-3, WordPerfect, dBASE IV, and Uniplex II Plus Windows.

Get the most advanced network solutions you'll ever need from the nation's leading full-service Systems Integrator for Sun Microsystems. Call ERI today at (800) 222-1050. Ask for Dept. E.

ERI™

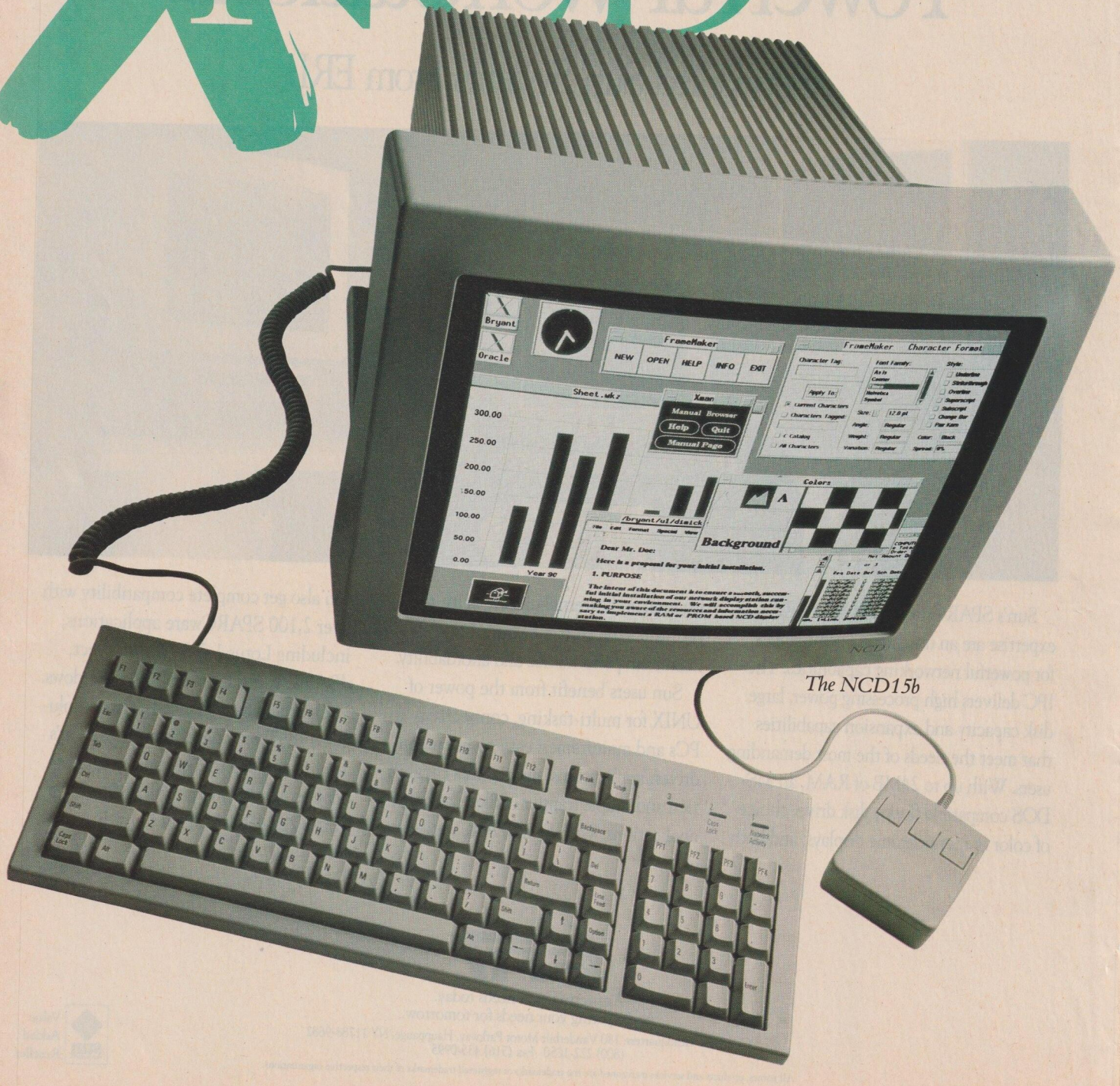
Answering your needs today.
Anticipating your needs for tomorrow.

Corporate Headquarters: 180 Vanderbilt Motor Parkway, Hauppauge, NY 11788-9682
(800) 222-1050 Fax (516) 435-0995

All names, products and services mentioned are the trademarks or registered trademarks of their respective organizations.

sun microsystems Value Added Reseller

NCD



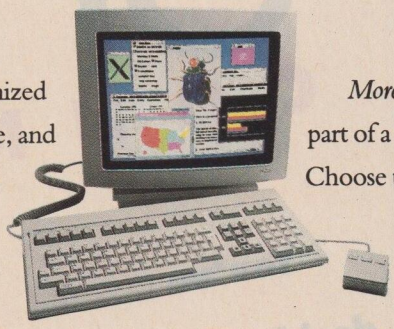
The NCD15b

More X. Less expense.

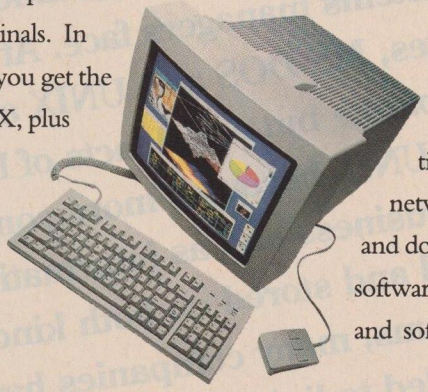
Introducing the NCD15b™. At only $1,495, it's an X™ terminal that's as easy to afford as it is to use. It's the most economical way to let more people access more computing power. The fastest way to get more people more productive. The best way to get the most out of the X Window System™.

With a graphical user interface to multi-vendor hosts, the NCD15b gives you simultaneous access to multiple applications, through multiple windows. Combine this with its low price; compact size; and 100 dpi, 70 Hz, monochrome 15" screen; and you have a powerful alternative to ASCII terminals. In one affordable package, you get the productivity benefits of X, plus these unique advantages only an NCD™ X terminal can give you.

Faster response. The NCD15b's powerful processor, optimized X11R4 software, and custom graphics ASIC work together to enhance every aspect of X performance.

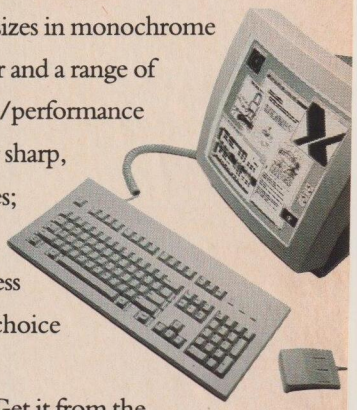


True interoperability. You get simultaneous, transparent access to more X applications on UNIX®, VMS™, or ULTRIX™ hosts through Ethernet™, TCP/IP, and DECnet™. Access non-X hosts via local Telnet or LAT™ sessions. And our XRemote™ software offers enhanced serial connectivity.



Easier network management. Get central configuration, SNMP-based network management, and downloadable server software for easier upgrades and software distribution.

More choices. The NCD15b is part of a broad family of X terminals. Choose the one that best suits your application from a full line of screen sizes in monochrome or color and a range of outstanding price/performance options. All offer sharp, flicker-free images; smaller footprints; silent, fanless operation; and a choice of keyboards.



Get the best. Get it from the leader in X terminals — NCD.

For more information on the low cost, high performance NCD15b call: 1-800-952-6300. Ask for Dept. D43. In Canada 1-800-833-0306. D43.

Network Computing Devices, Inc.
350 North Bernardo Ave., Mountain View, CA 94043
415-694-0650 FAX: 415-961-7711 Email: info@ncd.com

© 1990 Network Computing Devices. The NCD Logo, NCD, NCD15b, XRemote, and Raise your Xpectations are trademarks of Network Computing Devices, Inc. All other trademarks are registered to their respective companies.

Raise your Xpectations™

NCD

CIRCLE NO. 254 ON INQUIRY CARD

THE DOS TO UNIX CONNECTION

You've decided to hook your PCs to your UNIX system. Where do you go from here?

"What are we gonna do with all these PCs?" That's a question more and more information systems managers face. At many sites, MS-DOS and UNIX are separate but equal facts of life. As UNIX becomes more common in business and as information is used and stored on both kinds of systems, many companies have decided to link UNIX and DOS.

continued

BY FRANK HAYES

MICHAEL CARR / PC courtesy COMPAQ COMPUTER CORP. / WORKSTATION courtesy SILICON GRAPHICS INC.

File Edit Formula Format Data Options
Blue Yonder Aircraft
1991 Revenues by Region
North America
Europe
Far East
Total Revenue
An 8% increase from last year
Ready
COMPAQ
COMPAQ DESKPRO 386/25
SiliconGraphics
Personal Iris

DOS TO UNIX

Deciding that DOS and UNIX users should communicate is easy. The advantages can include things like file-sharing between PC and UNIX users, easier access to data on other systems, and enterprise-wide electronic mail. Figuring out exactly how to link the systems isn't so simple. In many places, PCs and UNIX systems are treated as completely independent–for example, UNIX systems would be used for database, accounting, and engineering applications, while PCs would handle word-processing and spreadsheets. Integrating both kinds of machines without creating new problems for the users is not a simple task.

How do you connect PC users to UNIX and still let them get a full day's work from their DOS-based application software? If the PCs are already linked together in a local-area network (LAN), how do you connect that network to your UNIX-based systems? Here's a rundown of your options–from simple to complex–for hooking together DOS-based PCs and UNIX systems with minimum disruption and maximum effectiveness.

Why Should You Do It?

What exactly does UNIX offer DOS users? At first glance, the answer seems to be, not much.

True, UNIX has processing power that reaches well beyond the limits of DOS-based PCs, and UNIX is designed for multiple users and networking. From a DOS view, that's beside the point. PC users use DOS for the applications. DOS applications come in a much wider variety than those available for UNIX, and they're usually more polished and user-friendly.

There's a more important point, though–your PC users are already using DOS applications. A DOS user doesn't just represent an investment in copies of Lotus 1-2-3, Microsoft Word, and dozens of pop-up programs and utilities. DOS users have a huge investment in *experience*–they've learned how to use these applications, and how to make them work together to get their work done faster and more effectively. If you're an information systems manager, you can't afford to throw away this investment.

UNIX is not the best reason DOS users should make the connection. It's the connection itself. It means direct communication between DOS and UNIX users in the form of electronic mail. It means data can be shared among DOS and UNIX users, along with access to large-scale UNIX resources such as large hard disks and fast printers. It also opens up the option of letting DOS users run UNIX applications–even distributed applications that use both UNIX and PCs.

Those connections can be a big advantage. The question is, how can you connect DOS users to UNIX systems without disrupting their work?

Two Main Ways to Connectivity

The kind of connection you'll make depends on the current set up of your PCs and UNIX system. You can usually choose between two options: a DOS PC as a terminal connected to a host or as a node on a network.

The first option, a terminal-style setup, can use a serial connection or a network to attach the PC to the UNIX system. Regardless of the hardware, with a terminal-style connection, the DOS user simply becomes a UNIX user–it's as if a UNIX terminal has been dropped inside the PC. When PC users want to communicate with the UNIX system they run a terminal emulation or telecommunications program. Once online with the UNIX system, PC users can do anything other UNIX users can do–including send e-mail and run UNIX applications. With most PC telecommunications programs, DOS users can also copy files to and from the UNIX file system. The rest of the time, when they're not running the terminal program, the DOS users will use their PCs exactly as they did before.

The second option is to set up the DOS-to-UNIX connection so that the UNIX system appears as an additional disk drive on the PC. (This usually requires connection to a network, so we'll call it a network-style set-up.) With the network-style approach, the PC user has access to files throughout the network. Those files can be copied to the PC, but they can also be used directly by DOS applications as if they were on a local disk drive. Compared to a terminal program, in which every file the PC wants to use must first be copied to a local disk drive, this can be a big plus.

The big minus for the network connection is that it's always there. Unlike a terminal program that takes up space in the PC's memory only when it's actually being used, the PC's network software is loaded into memory when the PC is turned on and is continuously taking up a sizable chunk of memory. That memory is limited to 640 kilobytes of program space–space that must be shared among applications, pop-up utilities, device drivers, and network software. As a result, adding a network to a PC may induce "RAM cram," a situation in which everything won't fit into the memory at once. For PC users, this can quickly throw cold water on the advantages of a network.

The Big Advantage: Saving Money

At first glance, even the "RAM cram" problem may appear minor when comparing the terminal and network approaches. After all, the network's ability to share files transparently is exactly what you're looking for in connecting your PCs to UNIX.

Besides, connecting PCs to UNIX as terminals may seem like an unsophisticated approach. But there are three compelling advantages to the terminal approach: It's cheaper, it's cheaper, and it's cheaper.

continued

Direct Serial Connections, Modems, and LANs

Direct Serial Connection	Modems	Local-Area Network
cable required	no cable required, but telephone line needed	must run (expensive) Ethernet or (cheaper) twisted-pair wiring
no modem required	modem required for each PC and each UNIX serial port	network interface card required for each PC
one UNIX serial port per PC for unlimited access	a limited number of UNIX ports for unlimited PCs	only one UNIX NIC required for all PCs
high-speed connections (9600 bps)	high-speed connections cost more than low-speed (2400)	very-high-speed connections (1-to-10 Mbps)
no telephone wiring or phone calls required	each PC and UNIX modem requires a telephone line; each DOS/UNIX connection requires a telephone call	no telephone wiring or phone calls required
all connections on-site. Length of connecting cables is limited	local users can log on to off-site systems; off-site users can log on to local systems. Distance from system is unlimited	all connections on site. Length of connecting cables is limited

A PC serial port can be achieved with an under-$50 add-in card, along with an inexpensive cable or a modem. Some serial ports are often already built into the PC, so you may not even need to spend $50. By contrast, a network requires a network interface card with a $100-to-$200 price tag, and (depending on the type of wiring) a potentially high cost for cables, as well. The PC terminal software is less expensive than a network operating system. The installation and maintenance costs of terminal connections are small compared to the installation of a typical PC LAN–and the ongoing costs of network administration.

The dollar cost isn't the only price you pay. One of the biggest differences between the terminal and network approaches is the cost of waiting. A terminal-style serial connection is about 1/100th as fast as a network. PC users may spend a significant amount of time uploading and downloading the files they're sharing through the UNIX system because each file must be completely copied from PC to UNIX. PC users can't utilize the large file system of UNIX for storing files too large to fit on the PC's own disks.

Wire or Phone Connections

You can connect a PC as a terminal in one of two ways: with a serial cable or dial-up modem. Each option has its own advantages.

In principle, connecting PCs directly means running a serial cable from each one to the UNIX system, and providing a serial port for each PC at the UNIX system. If you're connecting a large number of PCs, that can mean a significant cost for cables and ports–and some pretty long cables. In practice, though, you can only run a serial cable so far. Fortunately, you can run the cables from a number of PCs into a device called a terminal concentrator which multiplexes the signals from the PCs together and sends the result to the UNIX system on a high-speed connection. With or without a concentrator, all of the PCs can communicate with the UNIX system at once–and they can do so at top serial speed, typically 9,600 bits per second (bps).

On the other hand, using modems requires adding one to each PC and one or more to the UNIX system. Each modem must be connected to a telephone line, and the PC user must make a phone call every time he or she wants to communicate with the UNIX system. You may have to install the cable unless you already have enough phone lines. Check whether all those modems would be more expensive than direct serial connections. While modems allow you to use as many PCs as you'd like with just a few UNIX serial ports, only a few PC users can communicate with the UNIX system at once. Another limitation is that high-speed modems are expensive and the lower-cost modems are not as fast. For example, 2,400-bps modems only transfer data at one-quarter the speed of a direct serial connection.

Security is another consideration when choosing between direct connections and modems. Direct serial connections form a closed system: no one can dial in or out. Modems make it possible for PC users to call other computer systems, including bulletin-board systems and online services, however they also allow off-site users to log on to your UNIX system. Off-site log-ins are convenient for users who are traveling, but also a potential security problem, because unauthorized users may be able to log on to your UNIX system.

Network Standards

Terminal-style connections are relatively simple compared to PC networks. The range of choices can be overwhelming: Thick Ethernet, Cheapernet, 10Base-T, Token Ring, ARCnet, StarLAN, and an equally daunting list of network operating systems. Fortunately, after a decade of network wars, there are some standards that can make your choices easier. For UNIX networks, the default choice is TCP/IP. For PCs, it's Novell NetWare, the network operating system used for the vast majority of PC LANs.

If your PCs aren't currently networked, your best bet is to do it on the UNIX network's terms which means linking them together with Ethernet cable and then using TCP/IP protocol software to let them communicate. Each PC will require a network interface card, as will the UNIX system. Each PC will also need software that gives the PCs TCP/IP capability,

Making the DOS to UNIX Connection

The following products allow you to hook up with UNIX by using your PC to emulate a terminal or connect to a network as a node.

PC Terminal Emulation Software

Blast PC *$250-349*
Communications Research Group, 5615 Corporate Blvd., Baton Rouge, LA 70808; 800-242-5278 or 504-923-0888

DoubleView *$239 for eight users*
Digiboard, 6400 Flying Cloud Dr., Eden Prairie, MN 55344; 612-943-9020

Ice.Ten *$295 for eight users*
James River Group Inc., 125 N. First St., Minneapolis, MN 55401; 612-339-2521

MLink *$195*
Corporate Microsystems, Inc., P.O. Box 2059, Lebanon, NH 03766; 603-448-5193

PacerLink *$1,200 for five users*
Pacer Software, Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; 619-454-0565

PCworks *$195-249* **TEworks** *$99-149*
TouchStone Software Corp., 2130 Main St., Ste. 250, Huntington Beach, CA 92648; 714-969-7746

Rapport *$249*
Tundra Software, Inc., 3455 Harvester Rd., #19, Burlington, Ontario L7N 3P2 Canada; 416-681-3322

Smarterm *$225-375, file server $895-1,495 for five users*
Persoft, 465 Science Dr., Madison, WI 53711; 608-273-6000

Term *$195,* **Tiny Term** *$295 for five users*
Century Software, 5284 S. 320 W., #C134, Salt Lake City, UT 84107; 801-943-8386

PC TCP/IP SOFTWARE

Ice.TCP *$195-4,995*
James River Group Inc., 125 N. First St., Minneapolis, MN 55401; 612-339-2521

PC-NFS *$395*
Sun Microsystems Inc., 2550 Garcia Ave., Mountain View, CA 94043; 415-336-3234

PC/TCP Plus *$400*
FTP Software Inc., 338 Main St., Wakefield, MA 01880; 617-246-0900

WIN/TCP for DOS *$395, NFS option $95*
Wollongong Group Inc., 1129 San Antonio Rd., Palo Alto, CA 94303; 415-962-7100

such as Sun's PC-NFS or FTP Software's PC/TCP.

If your PCs are already networked, you will have to choose between replacing the existing PC network or coexisting with it. Though TCP/IP and NFS are likely to be less expensive than a PC network like Novell NetWare, unless there's a very good reason to replace it, you'll probably want to leave it alone. After all, ripping out an existing PC LAN, even if it only means replacing software, is sure to disrupt users.

Fortunately, you can usually connect an existing Novell network to a UNIX network without disturbing the Novell users. The key is using a bridge–a dedicated machine that converts packets of data moving between the two networks into the correct protocol, then switches them to the correct network. Novell has also announced that a new version of NetWare introduced this spring will offer direct support for TCP/IP as an option.

Other Networks, Other Options

Though TCP/IP and NetWare cast the longest shadows on the UNIX and PC network landscape, there are a number of other PC networking systems including Banyan Vines, which uses a UNIX system as a server; Microsoft's OS/2 LAN Manager and AT&T's UNIX version, LM/X; and Atlantix's Coconet, designed for talking to multiple protocols, including TCP/IP and Novell's IPX.

If your PCs are already linked with one of these networks, the rule of thumb is the same as with a Novell network: unless there's a very good reason to disturb your users, the best bet is to use a bridge or router (or, in some cases, just additional software on the PC network server) to let the PC LAN coexist with a UNIX TCP/IP network. On the other hand, none of these systems is a market leader–and one relatively strong PC network operating system vendor, 3Com, recently bailed out of the market in the face of Novell's dominance. Consequently, these options might not be the most secure choices for a new network.

One alternative to Novell or TCP/IP that actually offers enough advantages to make it a reasonable choice under some circumstances is PC Interface from Locus Computing. PC Interface is a low-cost, low-maintenance approach to networking PCs with UNIX. Like other PC networks, it uses a network interface card in each PC and presents the user with a virtual disk drive for using files on the network. PC Interface is a sort of "PC Network Lite"–it uses relatively little of either PC memory or UNIX resources, and doesn't require the services of a network administrator. PC Interface is also less expensive than a real network operating system–a single-user connection begins at $450 and doesn't require a dedicated server. Novell NetWare's starting price of $900 for five users is comparable, but requires a dedicated server.

What's the catch? Although PC Interface doesn't require extensive resources, it also doesn't offer the facilities of a full-scale network, such as those for developing distributed applications. In many respects, though, PC Interface is a good intermediate choice for those who have found that serial connections aren't enough, but don't require a full-scale network operating system.

Keeping Those DOS Applications

Once you have put the connection between DOS and UNIX in place, how does it fit into the applications currently used by your DOS users? That's an important question because the reason for making this connection is to give additional power to your DOS users without a sacrifice in productivity.

Using a terminal-style serial connection (direct or through modems), DOS users can send e-mail and copy files, but can't use the UNIX connection within DOS applications. If there's a spreadsheet file on the UNIX system you want to use in DOS, you must copy it from the UNIX system to your own local disk before you can start up your spreadsheet application to use the file.

In contrast, with a network connection, the DOS applications can directly access files on the network. Thus, a spreadsheet file in the UNIX system can be modified with PC's application providing "RAM cram" doesn't get in the way. This option aligns with the way your PC users actually work.

What about using applications running on the UNIX system? Not surprisingly, this is easier to accomplish using a terminal connection, or on a network using TCP/IP, than a conventional PC LAN. In fact, PCs linked to a UNIX system can run both character-based applications and X Windows-based graphical user interfaces. PC users can even run UNIX X Windows applications from within DOS-based windowing systems such as Microsoft Windows or Quarterdeck's DesqView/X. But be forewarned–the slower the connection, the slower the program will appear to run on the screen. A PC connected with a 2,400-bps modem will barely keep up with most full-screen character-based UNIX applications.

Planning for the Future

The DOS/UNIX connections we've discussed so far are highly conventional,

Network Interface Card Suppliers for PCs

3Com Corp. 5400 Bayfront Plaza, Santa Clara, CA 95052; 408-764-5000
Accton Technology Corp. 46750 Fremont Blvd., #104, Fremont, CA 94538; 800-926-9288 or 415-226-9800
Anthem Electronics 1160 Ridder Park Dr., San Jose, CA 95131; 408-453-1200
Artisoft 575 E. River Rd., Tucson, AZ 85704; 602-293-6363
CMC 125 Cremona Dr., Santa Barbara, CA 93117; 800-262-8023
D-Link 5 Musick, Irvine, CA 92718; 714-455-1688
David Systems 701 E. Evelyn Ave., Sunnyvale, CA 94086; 408-720-6835
Federal Technology 207 S. Peyton St., Alexandria, VA 22314; 800-255-3967
Gateway Communications Inc. 2941 Alton Ave., Irvine, CA 92714; 714-553-1555
Kodiak Technology 1338 Ridder Park Dr., San Jose, CA 95131; 408-441-6900
Lantana Technology Inc. 4393 Viewridge Ave., Ste. A, San Diego, CA 92123; 619-565-6400
Novell 122 E. 1700 S., Provo, UT 84606; 801-429-7000
Racal InterLan 155 Swanson Rd., Boxborough, MA 01719; 508-263-9929
Standard Microsystems 35 Marcus Blvd., Hauppauge, NY 11788; 516-273-3100
Ungerman-Bass 3900 Freedom Circle, P.O. Box 58030, Santa Clara, CA 95052; 408-496-0111
United Networks Inc. 2178 Paragon Dr., San Jose, CA 95131; 800-825-5864
U.S. Sage Inc. 2005 Tree Fork Ln., Ste. 113, Longwood, FL 32750; 407-331-4400
Western Digital 8105 Irvine Center Dr., Irvine, CA 92718; 714-932-5000

Easy Data Management Has Now Found Its Place In The Sun.

Introducing dBASE IV® for Sun.

It has all the advanced capabilities of the new dBASE IV version 1.1 for DOS. The data manager that *Software Digest* rated as the number one PC multiuser database (Oct. 1990). And that PC users have made the number one best seller (source: Audits & Surveys, Oct. 1990).

dBASE IV for Sun lets you easily manage data on your Sun system—without programming. At its heart is the Control Center interface, a single screen that puts everything at your fingertips.

There's no command syntax to remember. Just use the simple pull-down menus to highlight the task you want performed. Whether it's creating a new database from scratch, finding data in an existing database, or creating forms, labels and reports.

And if you've been using dBASE® software on a PC, you'll find that all your applications and data can be moved to your Sun in minutes. In fact, dBASE IV version 1.1 applications can be ported without even recompiling.

For those who want to program, dBASE IV offers sophisticated Fourth Generation Language (4GL) tools to make your job easier. Like SQL, Automatic Code Generator, Template Language, Integrated Debugger and Program Editor.

And dBASE IV takes full advantage of the Sun platform—a lightning-fast, multiuser, multitasking environment with more memory, for running larger applications. Plus greater security, extended data storage, and data sharing. If you're coming from DOS, this is the kind of high performance you've dreamed about.

For more information, call us now: 1-800-437-4329 ext. 1412.

If you want easy data management, you're about to see the Sun in a new light.

sun microsystems

Ashton-Tate®

Trademarks/Owners: dBASE, dBASE IV, Ashton-Tate and the Ashton-Tate logo are registered trademarks of Ashton-Tate Corporation. General Notice: Some of the product names used herein have been used for identification purposes only and may be trademarks of their respective companies. © 1991 Ashton-Tate Corporation. All rights reserved. GTSI#GS00K90AGS5216.

CIRCLE NO. 18 ON INQUIRY CARD

using well-known and popular protocols and techniques. But what about the future? Shouldn't you be looking ahead to buzzwords like OSI and distributed applications? If you are, chances are you'll need pretty good vision.

OSI is an acronym for Open Systems Interconnect, a standardized approach to computer networking. There's no real doubt in the minds of most networking experts that OSI will become a nearly universal standard for networking–someday. When that day will come is another question. International standards working groups have been struggling to define the complex seven-level OSI architecture for years, and it's likely to be years more before the final standards are in place and supported by products that actually work together. In fact, some observers joke that OSI will become the dominant networking standard "within 3 to 50 years."

In addition, OSI may never be a practical approach to networking DOS PCs because the OSI protocol stack is so large. Most estimates suggest that OSI will be prohibitively large in the relatively small available program memory in DOS. With "RAM cram" already a problem in existing DOS networks, OSI is far too much and too late if you're trying to network DOS and UNIX machines.

Distributed applications are a different matter. Facilities for building distributed applications that use both PCs and UNIX are currently available in networking systems such as Novell NetWare, Sun's NFS (which runs on TCP/IP), and even Locus' PC Interface. The technical possibilities are enticing–and, in fact, some corporate management information systems (MIS) departments have created complex distributed applications. "Distributed computing" is clearly a buzzword to be reckoned with, judging from proposed systems such as Sun's Open Network Computing system and the Open Software Foundation's Distributed Computing Environment.

At the moment, distributed applications are definitely on the bleeding edge of technology. In practice, the most common "distributed" applications are really just electronic mail. More complicated distributed applications exist, but are usually custom-built by MIS departments to meet specific needs. Solid tools for building distributed software are only now becoming widely available. In another two years, practical applications may become available, but both the applications and the tools to build them are most likely to be available on the most popular platforms–in particular, Novell and TCP/IP.

The Bottom Line

There's no simple, straight-line progression from low- to high-end DOS-UNIX connections. What's most expensive isn't the most powerful or flexible–or the best for you. The trade-offs are between installation cost, maintenance cost, flexibility, integration, speed, and impact on the way your DOS users work. Terminal-style connections will have the least impact on your DOS users and are relatively cheap and flexible. But they're also slow and offer little integration between DOS and UNIX. Networks lay a bigger hit on your DOS users, but offer more power with integrated remote file systems and higher speed. Networks also lay a bigger hit on your budget, both for initial price and the ongoing cost of maintenance.

Which broad approach you choose will depend on what you want to accomplish. How you handle the details–direct, serial, or modems? Novell or PC Interface?–should reflect both what you expect to need now and in the future. Almost any DOS-to-UNIX connection can be upgraded if you stick with standards such as serial connections and Ethernet networks. If you stray from the standard approaches you may find that the cost of improving your system includes throwing away everything you've already bought. If you stick with standards, you're not likely to be left behind. With minimal disruption to your DOS users, you can figure out exactly "what to do with all these PCs." ■

What About Windows on UNIX

You may think it's tough having two competing windowing systems under UNIX–OpenLook and Motif. But connecting DOS PCs and UNIX systems means choosing among three distinct kinds of "windows":

- Conventional character-based terminal emulators that allow you to run DOS and UNIX applications side-by-side on your PC include JSB Multiview Desktop and DESQview, running a terminal emulator or telecommunications package.
- PC-based X Windows terminal emulators, including XVision, X11/AT, HCL-Exceed, PC Xsight, PC XView, and DESQview/X.
- Microsoft Windows. Many terminal emulators will run under MS-Windows to let DOS and UNIX applications appear side-by-side. In addition, XVision and X11/AT will display X Windows under Microsoft Windows; and PC-Connect and TransActor allow multiple Microsoft Windows to access a UNIX host at once. —*F.H.*

Here's who to contact for more information:

DESQview *$129.95-219.90*
Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213-392-9851

HCL-Exceed *$495*
Hummingbird Communications Ltd., 2900 John St., Unit 4, Markham, Ontario L3R 5G3 Canada; 416-470-1203

JSB Multiview Desktop *$295*
JSB Computer Systems Ltd., Cheshire House, Castle St., Macclesfield, Cheshire SK11 6AF U.K.; +44-625-433618
U.S. distributor: The Santa Cruz Operation, 800-726-8649 or 800-461-6962 from Canada.

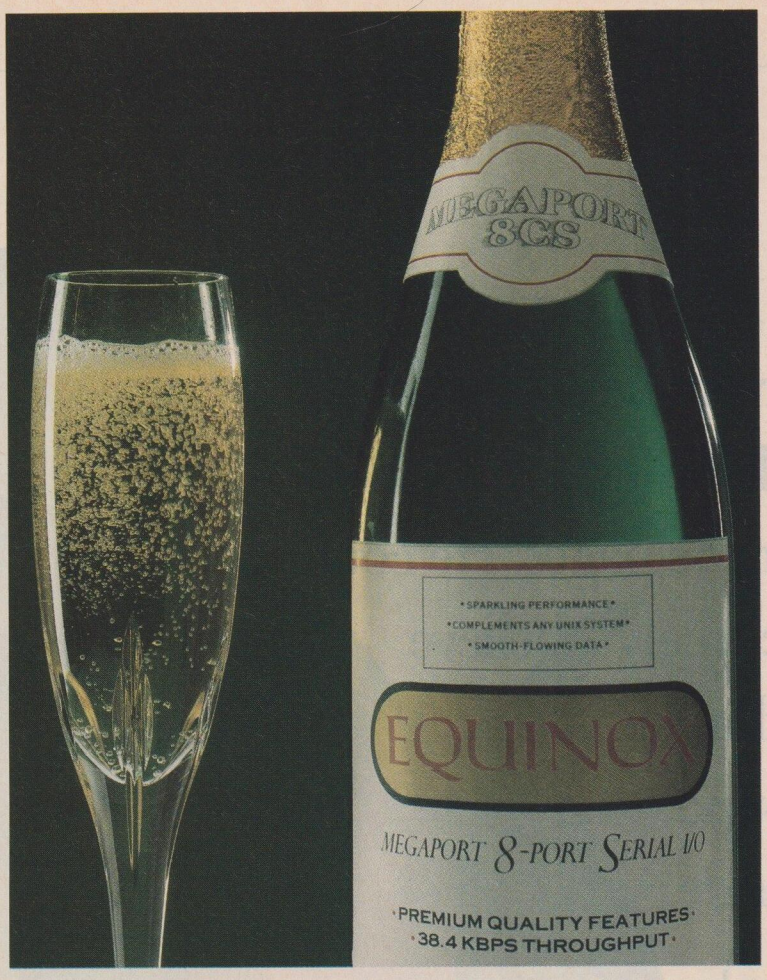
PC-Connect *$495* **XVision** *$449*
Visionware Ltd., 57 Cardigan Ln., Leeds, West Yorkshire LS4 2LE U.K.; +44-532-788858
U.S. Distributor: UniPress, 201-985-8000

PC Xsight *$425-495*
Locus Computing Corp., 9800 La Cienega Blvd., Inglewood, CA 90301; 213-670-6500

PC XView *$395*
Graphic Software Systems, 9590 S.W. Gemini Dr., Beaverton, OR 97005; 503-641-2200

TransActor *$495*
Systems Interface Inc., 223 Colonnade Rd., Nepean, Ontario K2E 7K3 Canada; 613-727-5001

X11/AT *$495*
Integrated Inference Machines, 1468 E. Katella Ave., Anaheim, CA 92805; 714-978-6776

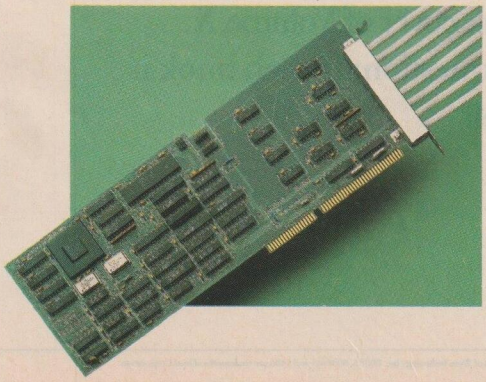


Champagne Performance on a beer budget

Introducing MEGAPORT 8CS — the newest addition to EQUINOX's vintage of fine MEGAPORT multi-user boards, delivering premium performance at an unbeatable price.

Like the highly acclaimed 12- and 24-port versions of MEGAPORT, and the 96-port MEGAPLEX cluster controller, this 8-port model offers top speed, low cost, and three times the performance of competitive products.

MEGAPORT 8CS — ONLY $795



Unlike any competitive product, MEGAPORT 8CS provides throughput that *never* degrades as system load increases. The 8CS uses the same EQUINOX 16 MHz RISC-type processor found in other MEGAPORT models. And because the processor performs serial I/O in hardware, MEGAPORT 8CS delivers continuous data on all ports at 38.4 kbps full-duplex — while using less than 0.5% of the host CPU per port. This gives you a faster-running system with snappy screen refreshes.

By requiring only 16 KB of memory space, MEGAPORT 8CS fits effortlessly into virtually any system. In contrast, other boards demand as much as 128 KB of memory space per board — making installation difficult, and sometimes impossible.

To further simplify installation, the 8CS features our standard MEGAPORT "soft" set-up — no dip switches, no straps and no programming of interrupts, I/O addresses or DMA channels. Drivers are included at no extra charge for all popular versions of System V UNIX and XENIX. They provide everything you demand from a multi-user board, including transparent print, multiple sessions, and more.

Just add a three-year warranty, and you have what you've always needed in an 8-port multi-user board — MEGAPORT quality!

MEGAPORT. Now you can indulge your taste for premium serial I/O performance, even on a skinny budget!

EQUINOX

Equinox Systems, Inc.
14260 S.W. 119 Avenue
Miami, Florida 33186
800/328-2729 • 305/255-3500
FAX 305/253-0003

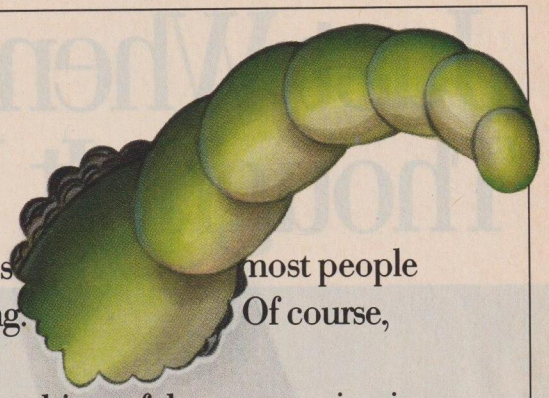
CIRCLE NO. 210 ON INQUIRY CARD

Sir Lawrence pulled Volume IV from the shelf, blew off a cloak of dust and opened th brittle pages. He could scarcely believe what he found inside.

True, he hadn't consulted these particular journals in years and, admittedly, he had acquired the ten-volume set in his youth from an odd little book store on the Thames, but still! Holes!? A bookworm had eaten clean through the pages. Indeed, to Sir Lawrence's considerable chagrin, he found the ravenous little bugger had chewed, in a straight line, from the front cover of Volume I to the back cover of Volume X.

All of which brings us to our seemingly simple question: If each book is exactly two inches thick, how far did the bookworm travel?

© 1991 Wyse Technology Inc. WYSE is a registered trademark and WYSE DECISION 386sx/16s, WYSE DECISION 386sx/20, WYSE DECISION 486/25 and WYSE DECISION 486/33e are trademarks of Wyse Technology Inc. 80386, 80386sx and 1486 are trademarks of Intel Corporation.

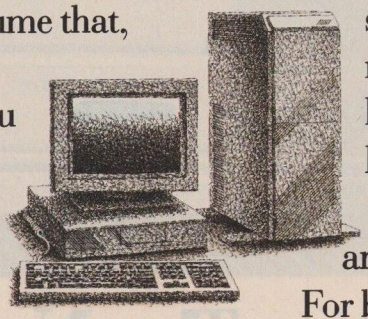


In tussling with this type of cerebral aerobics most people make a simple but serious error: They *assume* something. Of course, this happens without realizing it. But still, it happens.

As you'll see in a moment, the way to avoid making a false assumption is to work things out methodically. Carefully thinking through each step.

For instance, consider this question. A company makes one of the broadest lines of computer terminals in the world. They have for years. In fact, they've delivered over three million of them.

If you needed terminals you'd probably think of them. But what if you needed PCs? Would you assume that, since this company is so dominant in terminals, they must not do a real number in PCs?



Tsk, tsk. Have you learned nothing?

Well, as you may have *correctly* assumed, the company in question is Wyse. And if you've been assuming we don't have an impressive array of powerful, priced-right PCs it would be a shame. For both of us.

The Decision Series PCs: 386SX/16S (shown), 386SX/20, 486/25, 486/33E (shown). Advanced ergonomics, finicky attention to detail, exceptional power for the dollar.

Consider our new Decision Series. Four models that offer a rich set of features. Generous power supplies, three styles of ergonomically advanced chassis, multiple configurations, popular Wyse-designed keyboards, aggressive pricing and bundled DOS 4.01.

For starters.

Of course we realize there's a good chance some of you may have read this far because you're more interested in the answer to our puzzle than in our products. You've *assumed* we'd bury the answer down here somewhere. Well, you're wrong again. At least partially. So go look on page 74.

To learn more about our Decision Series PCs call us. We'll send you complete specs plus a poster of additional Cerebral Aerobics. To help keep your original equipment personal computer in top form. 1-800-GET WYSE.

Now that it's clear we make an impressive line of PCs, you might be tempted to assume we stop there and don't get into the even more sophisticated products like super fast multiprocessing systems for the UNIX environment. With speed in the 100 MIPS range.

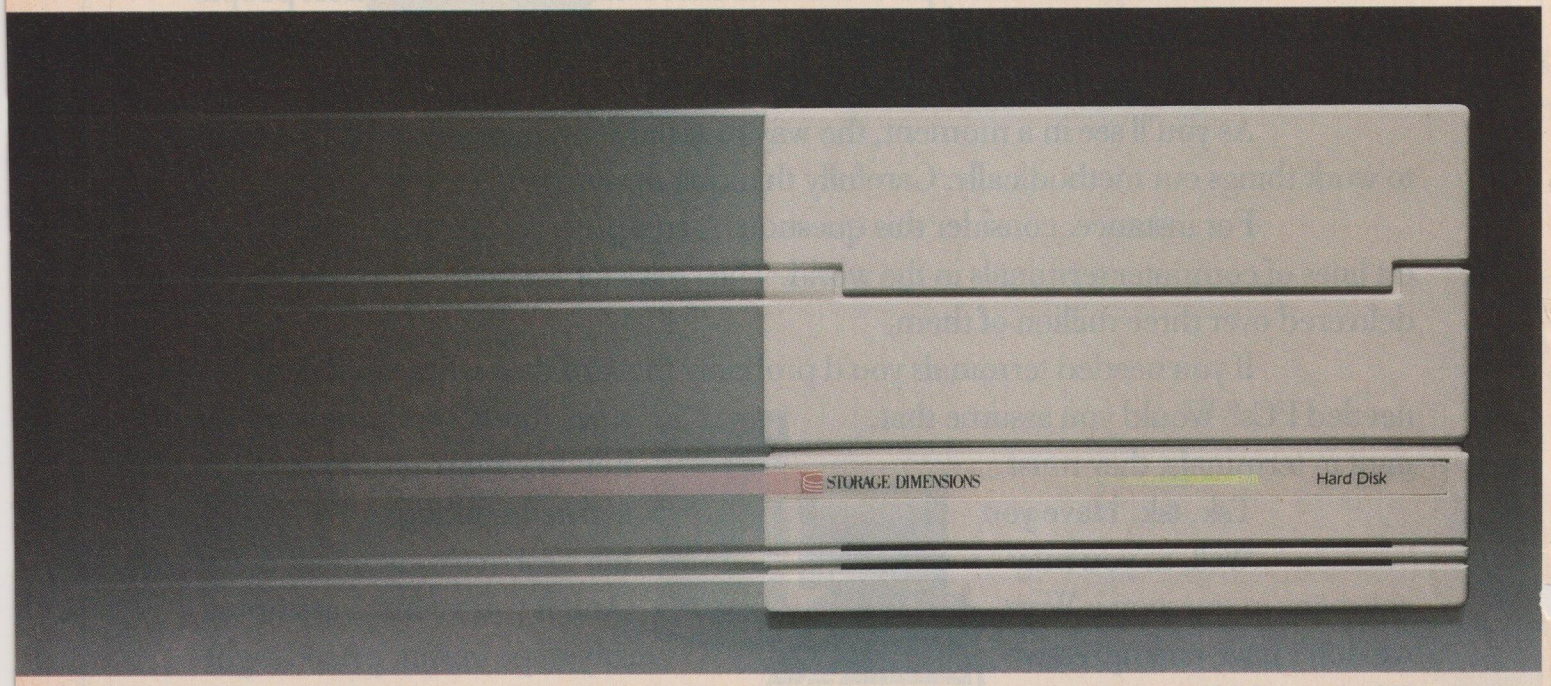
But you wouldn't assume that after all this. Would you?

WYSE

You're doing it again. Just because this little type is down here and printed upside down you assumed you'd find the answer this easily. No way, San Jose. Refer back up to the ad and your patience will be rewarded.

CIRCLE NO. 145 ON INQUIRY CARD

Just When The Competition Thought It Was Catching Up.



The New Series 1300.™

Defining the Next Standard for Storage.

Storage Dimensions' Series 1300. More speed, more capacity and more reliability than any storage systems you've ever used.

At the heart of every Series 1300 model is a drive mechanism with remarkable specifications. 11.5 ms average seek time and 5400 RPM spindle motor to dramatically improve access to your data. 1.3 gigabytes formatted capacity. And MTBF ratings that can be measured in decades. But it takes more than just numbers to set a new standard.

PERFORMANCE MATCHED · FOR
NetWare
OS/2 UNIX
Macintosh

Mainframe Capacity and Performance.

It's what you do with the numbers that counts. Our Series 1300 has transformed them into storage solutions with unparalleled performance and reliability. We applied our fully integrated, systems engineering approach to the design. We added our advanced 16- and 32-bit bus master adapters. And we incorporated the latest performance innovations in our device drivers to nearly double the work your system can do.

Our Series 1300 is available today for NetWare,® OS/2,™ UNIX® and Macintosh,® in subsystem capacities from 1.3 to 5.2 gigabytes. To build systems to over 36 gigabytes. Now those are numbers — mainframe level numbers — your systems can *really* put to work.

Stay Ahead of the Pack.

Cutting edge technology. Innovative design. Comprehensive systems focus. Three reasons our Series 1300 is the latest example of how the Number One company in network and desktop storage stays in front.Call (408) 879-0300. Storage Dimensions, 2145 Hamilton Avenue, San Jose, CA 95125.

STORAGE DIMENSIONS

© 1991 Storage Dimensions. Series 1300 is a trademark of Storage Dimensions.

CIRCLE NO. 252 ON INQUIRY CARD

Big Red

PC LAN leader

Novell's strategy

is to run on all

machines. Now it's

making the climb

to UNIX

By Howard Baldwin

When it comes to PC-based local-area networks, TCP/IP is a piker compared to Novell. The chances are now greater than 50-50 that any company with a PC LAN is using Novell's network operating software. By Forrester Research's estimates, 53 percent of all shipments of PC LAN protocols in 1991 will be Novell's IPX protocol, with the number of shipments increasing through 1994. Other estimates give Novell an even higher percentage of the marketplace. If IBM is Big Blue, then Novell is Big Red.

TINA LEE-HILL

In second place, according to Forrester, are shipments of the Netbeui protocol used by IBM and Microsoft, at about 12 percent. The favorite protocol of UNIX, TCP/IP, trails both with only 10 percent saturation. It's our favorite because it is an open protocol sold by many vendors.

But what do we know? We can talk about the joy of TCP/IP all we want while Novell's shipments grow. "A lot of people thought [Microsoft's] LAN Manager would eat into their marketplace, but [that hasn't] happened," says networking consultant Steve Spanier. Revenues rolling into Novell's Provo, Utah headquarters reflect this growth. Sales rose 18 percent between 1989 and 1990 to just under $500 million.

If Big Red is finding gold in PC LANs, why is it now interested in UNIX? Based upon analyst estimates and information in Novell's annual reports, UNIX revenue was between 10 to 15 percent of Novell's total revenue. That's around $49 to $73 million last year–mostly from its acquisition of Excelan–one of the largest total software revenues in UNIX.

Now Novell has embarked on a multifaceted program involving new products and licensing agreements to simplify integrating its LANs into larger systems, especially those running UNIX. So far, its biggest customers have not been the giants of UNIX hardware–Sun Microsystems, Hewlett-Packard, and Digital Equipment Corp.–but smaller players like Prime, Wang, Data General, and Altos.

Additionally, while consultant Spanier might discount Microsoft's products, its competition might be a major motivating factor for Novell. Because of Microsoft's clout, the LAN Manager network operating system and LAN Manager for UNIX (LM/X) still have the potential to cast a giant shadow over the desktop. It was in part to combat Microsoft that Novell considered merging with Lotus last year.

continued

Noorda's Neutrality

Novell president, chairman, and CEO Ray Noorda stakes out a purely benign stance. Noorda, who coincidentally enjoys mountain climbing, says the company has adopted the "Switzerland approach." The key is neutrality. Outside of its UNIX strategy, Novell has relationships with almost every major systems vendor in the computer industry.

It has even collaborated with former competitor 3Com. Before 3Com conceded defeat and bowed out of the network operating system market earlier this year, it had worked with Microsoft in developing LAN Manager. "We have a hard time with the term [competition]," says Noorda. "We consider them all to be compatriots."

Noorda insists the company is driven by two things: customer demands and standards. He believes that while networking is complex, it's still in its early stages between a changeover from mainframes and minicomputers to desktop devices. "There will be lots of [networking] choices that people will make," says Noorda. "Whether it's Microsoft products, or UNIX-based products, we will do what we have to do to make them work together with NetWare."

One of the mainstays of Novell's UNIX strategy is Portable NetWare, originally called NetWare for UNIX. A version of NetWare written in C, Portable NetWare is currently ported to run on hardware, primarily minicomputers, from 13 different manufacturers. Why the name change? Because Portable NetWare can also run on top of any operating system and lets users on Novell LANs access proprietary minicomputers as well as UNIX minis. HP, for instance, is handling the Portable NetWare implementation for its proprietary HP 3000 minicomputers, while Innovus, a Canadian software developer, has been contracted to port the Portable NetWare version to its UNIX-based HP 9000 minicomputers.

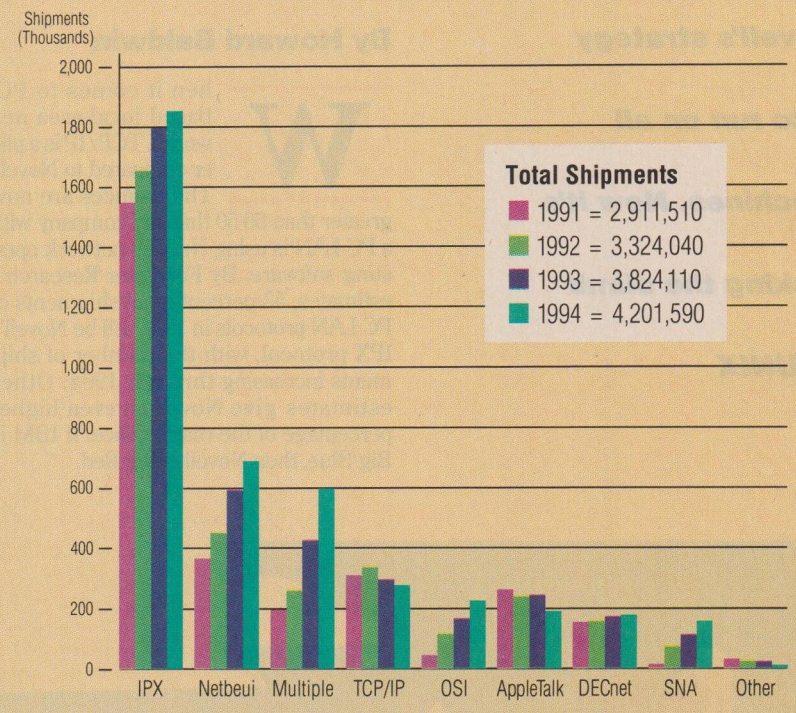
Whoever's machines they are, they act as NetWare servers, allowing users with PCs in NetWare LANs to access information in both DOS-based NetWare files and UNIX-based files.

While Novell may have conquered the PC LAN industry, it has not yet lured the shining lights of the UNIX industry. So far the list of the Portable NetWare licensees does not show Sun, Silicon Graphics, DEC, Wyse, Compaq, or AT&T. The first to ship versions of Portable NetWare, rather, are struggling minicomputer vendors like Altos, Data General, NCR, Prime, Unisys, and Wang. Had these struggling minicomputer vendors been quicker to recognize the PC-LAN invasion for the revolution it was, they might not be struggling now.

Big Red Beats Big Blue

According to Forrester Research's estimates, Novell's IPX protocol currently runs in over half of all LANs shipped and is projected to dominate the market through 1994. The second most popular protocol is estimated to be the Netbeui protocol used by Microsoft and IBM. TCP/IP is expected to follow Netbeui until 1993 when LANs running multiple protocols are projected to surpass it.

Projected U.S. LAN Node Shipments 1991 – 1994



SOURCE: Forrester Research, Inc.

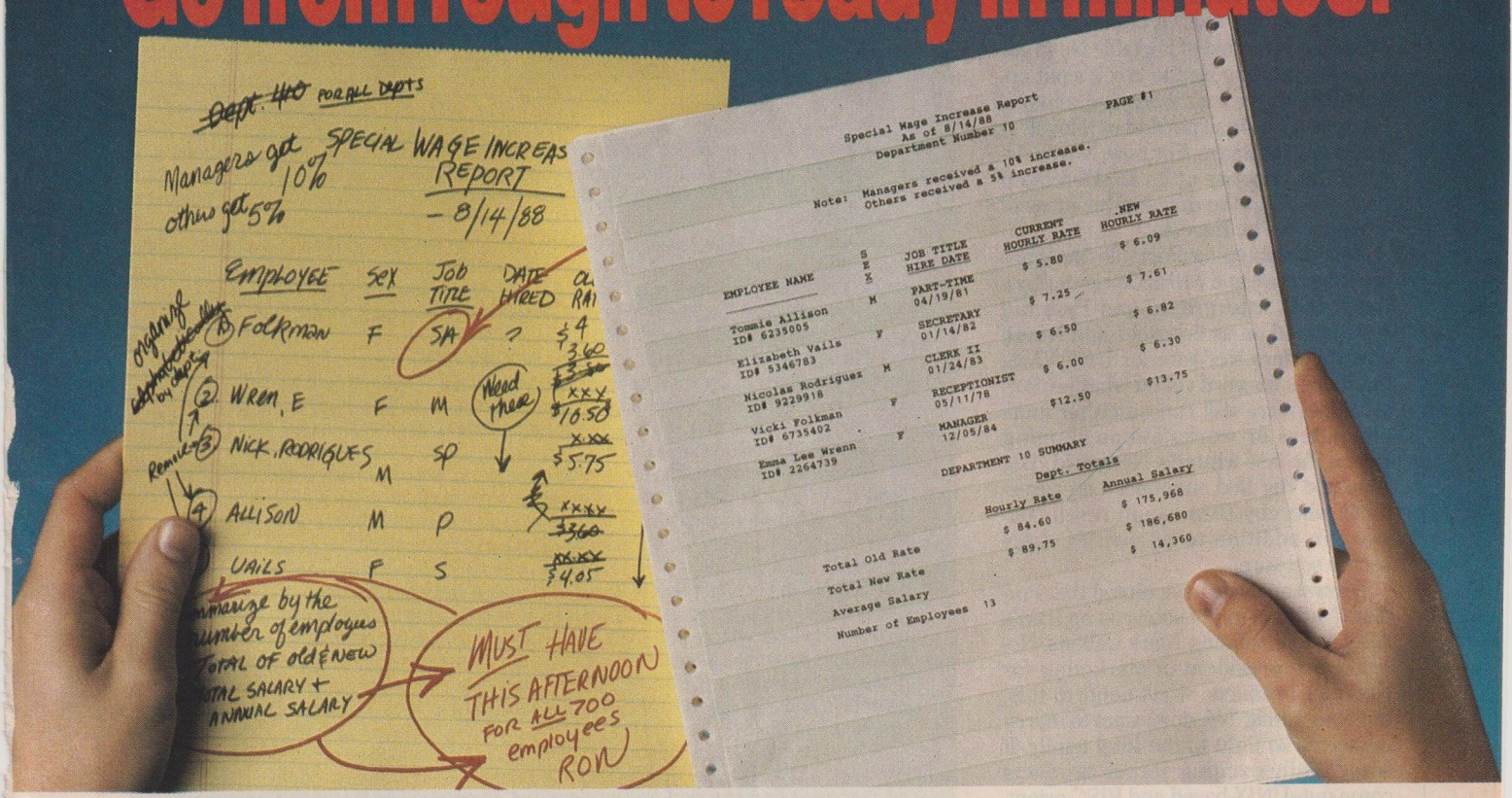
Nevertheless, consultant Spanier calls Portable NetWare a "good match" for both Novell and the licensees. The minicomputer vendors saw their markets eroding as LANs proliferated. "At the same time, Novell recognized the benefits of a multiplatform approach." The big advantage for Big Red, according to Spanier: "They don't have to spend the engineering effort, hiring people from all over the world who know these machines well."

Not all Portable NetWare licensees are minicomputer vendors. Interactive Systems' port of Portable NetWare, for instance, lets users access PCs running Interactive's UNIX. If you ask, "Why not SCO UNIX?"–keep in mind that 20 percent of The Santa Cruz Operation is owned by rival Microsoft.

When asked why more of the top-tier vendors aren't represented in Novell's clientele, Noorda shrugs. "It's harder to get the bigger guys to participate early on. It's harder to move their inertia." Nevertheless, Noorda feels the progress of the Portable NetWare program is "positive" and that it's too early for the industry to dismiss it as a failure simply because of the smaller financial balance sheets of its earliest adherents.

How much do these vendors pay Novell to license Portable NetWare? Novell won't reveal the cost of either a Portable NetWare license or the royalty fees, other than to say it's in the neighborhood of six figures. Terrie Murphy, a senior research analyst for Smith Barney, estimates that Portable NetWare revenues

Go from rough to ready in minutes.



With Intelligent Query® (IQ), the #1 UNIX report writer

IQ—Not Just "Another Report Writer"

IQ is a sophisticated decision support tool—built from the ground up to be easy enough for end users and powerful enough for DP professionals.

IQ—The Report Writer for Everyone

When you put IQ to work on your UNIX applications—everyone becomes more productive.

End users can create their own custom reports and graphs by easily retrieving, sorting, calculating and formatting information. Additionally, users can extract host-based information and reformat it for use with popular PC programs like Lotus 1-2-3 and others.

Technical managers and developers can create production reports in a fraction of the time normally required. You will spend less time supporting users or creating ad hoc reports, and more time on urgent development issues.

"Ease of Use"—A Lot of Software Companies Talk About It . . . IQ Defines It With:

- A windows-like menu style
- Visual Screen Painter
- English 4GL
- Predefined dictionary to shield users from technical aspects of database management

IQ—Optimized for Efficiency

IQ integrates with your existing applications . . . taking advantage of existing design strengths. IQ utilizes incremental selection, native key linkage, index retrieval and numerous other techniques to maximize efficiency and performance.

IQ supports:

- Over 60 different database systems, file handlers, and ISAM techniques
- Over 35 different hardware vendor platforms (call for complete listing)

IQ—Puts You in Smart Company

IQ is ***the #1 choice*** for thousands of UNIX users who put IQ to work every day—turning data into information.

IQ is ***the #1 choice*** for software companies. Today over 650 database companies, compiler manufacturers, and vertical software companies remarket IQ under their own trade names.

See for Yourself

Why IQ is ***the #1 UNIX Report Writer.*** Call today for information on how to obtain a "live" (not a demo) evaluation copy.

Programmed Intelligence Corporation

USA: 3295 River Exchange Drive • Suite 550 • Norcross, Georgia 30092

UK: Worthy Park House • Abbots Worthy • Winchester S021 1AN • Phone (0962) 885900

Act now! Call today: 1-800-458-0386 • In Georgia (404) 446-8880 • FAX (404) 448-4088

The products mentioned above are trademarks of their respective companies.

CIRCLE NO. 129 ON INQUIRY CARD

didn't amount to more than several hundred thousand dollars in the last quarter of 1990, adding that "it could increase over time. The cost of Portable NetWare varies depending on the box it's put on, but Wall Street isn't worrying about it because it's a small portion of [Novell's] revenues," she says. For now, Novell derives the majority of its UNIX-related revenues from the ongoing business of what used to be Excelan.

Vendors shipping Portable NetWare are Interactive and MIPS Computer Systems. ICL, Intergraph, and Pyramid have signed on as licensees and Novell already offers NetWare for DEC VMS, but there's no word yet on whether Portable NetWare will run on either minicomputers or workstations running Ultrix. At last winter's Networld, Big Blue and Big Red announced an agreement whereby IBM would resell NetWare in addition to its own PC LAN server software.

Several analysts have hinted that Portable NetWare might soon run on IBM's AIX-based machines. Mark Calkins, Novell's vice president of marketing for NetWare products, won't confirm this, but does admit, "We don't want to marry ourselves so tight to the Intel family. If some really exciting server products come out–UNIX-based and RISC-oriented–that blow the socks off [the user], we want to make sure NetWare's on it. We hope, over time, to be on every RISC machine, both single- and multiprocessing." Eventually, he adds, the Portable part of the moniker will be deleted.

The NFS Alternative

There is one other Novell-to-UNIX alternative. In version 3.11 of NetWare that started shipping this past spring, Novell incorporated TCP/IP capabilities. Because Sun's Network File System (NFS) runs on top of TCP/IP, Novell has also announced a product called NetWare for NFS. The latter is what Novell calls a NetWare Loadable Module (NLM)–software that runs with, or on top of, NetWare. Any NetWare-compatible software, such as messaging applications, comes in an NLM. The NLM lets UNIX users on a network running NFS access and print files from servers running NetWare 3.11 through traditional UNIX commands.

Why both? "They're really two different ways to solve a problem," explains Calkins. "We have many customers who are familiar with TCP/IP, and they'll continue to use that. Portable NetWare takes a slightly different approach. Its goal is to go one step beyond a terminal-type connection or simple file transfer to a complete integration." In short, with Portable NetWare, users see the NetWare interface they know; with NetWare for NFS, UNIX users see the UNIX command line interface they know.

Can Novell Remain Humble?

The question remains as to why Novell has to worry about Microsoft. LAN Manager never corralled the market-share Microsoft intended it to, perhaps because it was based on IBM's OS/2 operating system. Some analysts feel Novell's momentum is unstoppable. Janet Hyland of Forrester Research predicts that in 1994, Novell's NetWare will still be the operating system of choice for almost half of all LAN shipments.

Hyland also projected shipments for what Forrester calls LINs, or LAN internetworks, which it defines as LANs interconnected with wide-area networks. According to her report, between 1990 and 1994, Novell's shipments in this arena will almost double. Hyland further thinks that as LANs replace minicomputers and mainframes in large accounts, Novell has too much momentum to be surpassed by Microsoft or IBM. "Forrester is also skeptical that UNIX servers will become popular for PC LANs," Hyland's report adds. "We doubt that users want to introduce a new operating system to workgroups when NetWare is working well."

Given the projections for Novell's success, will the company become arrogant? Noorda invokes the legend of the software developer who ceded IBM's business to Microsoft because he brushed off an appointment with Big Blue executives. "We always recognize the potential fatality of getting arrogant," says Noorda. "The time for arrogance doesn't exist anymore. There are too many strong-willed people who can do something better and emerge as a real winner. We understand the fundamental that what can go up, can go down."

continued

Portable NetWare vs. LAN Manager for UNIX

Several ways to link PC LANs to UNIX systems exist, including software from Wollongong and FTP Software. The options from Microsoft and Novell both use the concept of client-server computing in which the desktop is the client and the host is the server.

Novell has taken its NetWare network operating system and made it portable, licensing it to other vendors. Microsoft has tackled the challenge differently: while it also licenses its network operating system, LAN Manager, it lets its licensees rewrite it for UNIX as LM/X. Licensees include Hewlett-Packard, AT&T, Data General, and The Santa Cruz Operation.

Both operating systems run as native UNIX with DOS clients, according to Steve Basile, manager of engineering services with systems integrator ERI. The difference, he notes, is that "Portable NetWare is NetWare compiled to run on a particular platform. LM/X is a rewrite, not a port." This is why the individual vendors' versions of LM/X won't interoperate.

Versions of Portable NetWare, on the other hand, will interoperate. Novell insists upon it. A Portable NetWare licensee gets source code and development tools. A set of application programming interfaces has also recently become available. Mark Calkins, Novell's vice-president of marketing for NetWare products, says, "We have a certification test suite that's a comprehensive set of programs. It exercises all of the functions and features of Portable NetWare."

Once the port is completed, a process of optimization begins. "Most of the optimization needs to happen at the LAN driver and IPX protocol stack. We have one set of tests that checks out IPX and makes sure you can talk to it." Calkins cautions that a lot of vendors add other features to NetWare in terms of communication with gateways and X.400 services. "We don't certify any of that. We focus on NetWare services," he says.

There are companies–DG and HP among them–that support both Portable NetWare and LM/X. Gregory Eckstein, communications product manager for DG, says his company concentrated on NetWare first because of its larger installed base, and that was where the bulk of the requests had come from.

Between the two, says networking consultant Steve Spanier, "technically there are myriad plusses and minuses." But there's one big plus for Novell, he says: "Portable NetWare is NetWare. It's already popular. LAN Manager is not out there. If you're going to come out with something new, or a new version of the same kind of technology, then it's got to have definite price advances, definite feature advantages, or both." LAN Manager never provided such differentiation from NetWare. —*H.B.*

Smooth Skating Between DOS and UNIX

Fusing DOS and UNIX.
For smooth integration of DOS and UNIX or Xenix, ICE.TEN is the standard. It provides memory resident Wyse 60 or Color Console ANSI emulation, easy file transfer, and a DOS command shell for UNIX.

DOS PC's talk to UNIX Printers.
Now with Host Print™, ICE.TEN.PLUS allows a DOS application to print transparently to any UNIX or Xenix printer.

Perfect with Word.
Perfect with WordPerfect.
ICE products are clean performance software, fine-tuned for the best UNIX and Xenix applications; mature software that works right the first time.

Nice Price.
ICE.TEN starts at $295 for a set which includes DOS and UNIX (or Xenix) files. One license allows eight DOS PC's in one location to be connected to a UNIX host. ICE.TEN.PLUS supports an unlimited number of DOS PC's in the same location connected to a single host. It has features of ICE.TEN, plus Host Print, VT220, and speeds to 115,000 baud. For networks, ICE.TCP is DOS TCP/IP with ICE emulation.

For more hard, cool facts, just call:
James River Group Inc
125 N First St Minneapolis MN 55401 USA
612-339-2521

James River Group
INCORPORATED

How To Make Unix Backups Easier, Faster and Safer

You can avoid data loss (and lost dollars) with **BRU**, the reliable Unix Backup and Restore Utility. For over six years, thousands have depended on **BRU** because it:

- **Detects Errors & Recovers:** Retrieves all possible data. Won't stop like tar.
- **Verifies & Compares Files:** Protects your data by checking each byte of every file (not just the file names)
- **Does Incremental Backups:** Select only the files that have changed.
- **Compresses Data:** Reduces tape usage, compresses files 30% to 90%.
- **Runs Faster:** Saves time, "tunable" for top performance. Up to 5x faster than tar.
- **Permits Easy Crash Recovery:** Saves and restores the root filesystem and **ALL** special files (the files skipped by others).
- **Does Automatic Backups:** Run under cron and do unattended backups.

BRU costs very little (as low as $199), when compared to the cost of *losing* your data.

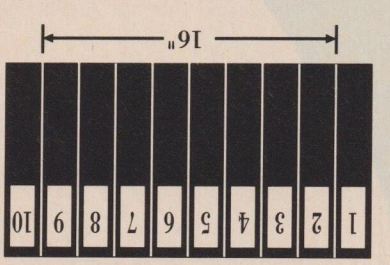
Available for ALL flavors of Unix, including SCO Unix/Xenix, 386ix, RS/6000, Ultrix, Sun, NCR, and SysV Rel 4. Supports networks.

*You can "test-drive" **BRU** RISK-FREE for 60 days, CALL 602-820-0042.*

Also, get an information-packed **FREE** report, ***11 Common Backup Mistakes and How to Avoid Them.*** Please call before 5 pm.

Contact: **Enhanced Software Technologies**, 5032 South Ash Ave., Suite 107-UW, Tempe, Arizona 85282. Fax: 602-491-0865 (24 hrs).

CIRCLE NO. 77 ON INQUIRY CARD



Answer To

WYSE

Cerebral Aerobics Program

No 3

He munched his way through 16 inches. Because, as you obviously figured out by now, the cover of Volume I is on the right, while the back of Volume X is on the left.

Acquiring Minds Want to Know

Novell CEO Ray Noorda's Switzerland approach may make him sound like Heidi, but over the last eight years he has transformed Novell from a struggling network hardware vendor to one of the most successful software development companies in the world–ranking only behind heavyweights Microsoft, Lotus, and Oracle.

Noorda's Switzerland approach to the computer industry hasn't stopped Novell from marching down the acquisition trail. Since 1988, in arenas where Novell's expertise has faced a "particular shortfall," as Noorda says, the company has been assiduously acquiring what it needed. Noorda does not rule out the possibility of more acquisitions, especially in the UNIX market.

For IBM connectivity, it acquired CXI. For electronic messaging, it was Indisy Software. For database management, it acquired SoftCraft and purchased a minority interest in Gupta Technologies, a developer of SQL database technologies. Most importantly for the UNIX market, for its TCP/IP and OSI expertise, Novell acquired Excelan. Excelan itself had just acquired Kinetics, a Macintosh connectivity firm, so Novell got it in the bargain.

Unlike many techno-mergers, each has added specific expertise to Novell's interoperability game plan. Most of the companies were transformed into research centers instead of being dissolved. According to several sources outside Novell, employee attrition, the bane of most mergers, has been remarkably low. In fact, two years after the Excelan merger, Excelan's president and at least four other high-level executives hold commensurate positions within Novell.

As for Novell's UNIX strategy, much of it can be traced to that acquisition. "Our objective [in buying Excelan] was to increase the span of expertise," says Noorda. Until then, Novell was focused on the DOS-based environment. Impressed by Sun's success with UNIX on the desktop, he adds, "we felt we needed to be involved." Excelan had people who had been good at Open Systems Interconnect, TCP/IP, and working in the UNIX environment. "Those were important to our portfolio, to allow us to expand our capabilities."

But Excelan was ostensibly a hardware manufacturer. While there was initially a flurry of questions in the marketplace whether Novell, which had started out as a hardware company, was branching back into it again, any confusion was quickly allayed when the spinoffs began. While it retained the rights to Excelan's network monitoring device, now called the LANtern, Novell spun off the Ethernet board business to board manufacturer Anthem, and the Kinetics' Macintosh connectivity products, including the Fastpath gateway, to Shiva.

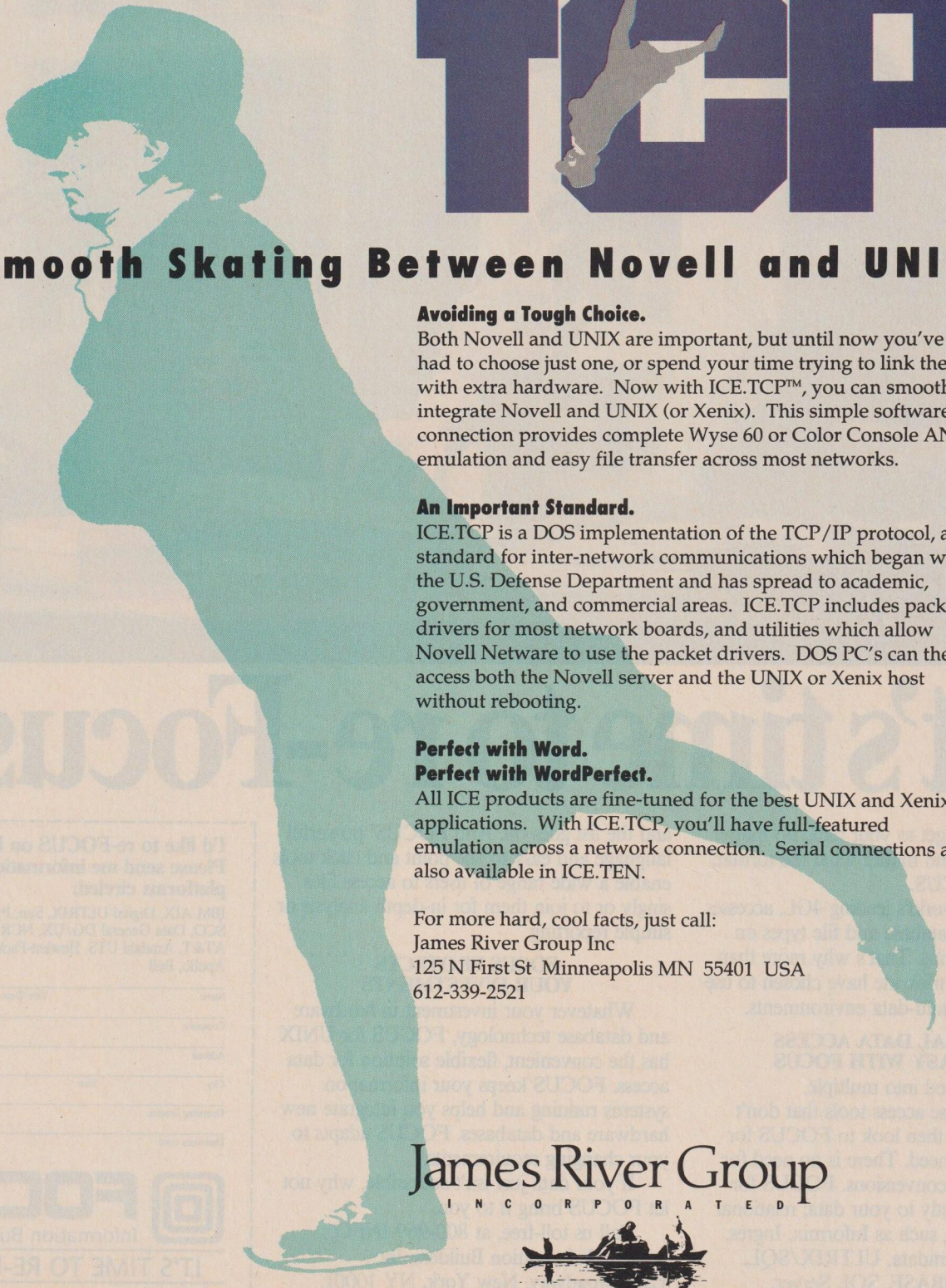
Shiva president Dan Schwinn believes Novell is concentrating on software because "margins have to keep going up somehow." But, he adds, Novell "would start a new hardware product line today" if it really wanted to. More likely, says Schwinn, it would seek a strategic partner.

Networking consultant Steve Spanier says that Novell sticks to software as part of its neutrality approach. "Novell says, this is our network operating system, this is our added value. As far as the other stuff, we really don't care. We don't care about the physical network media, the I/O devices involved, or the platform. We don't care about anything else but NetWare." —*H.B.*

"The key is to keep investing in the growth of the market and help other people to participate," he adds. While this sounds inherently generous, the key to Novell's strategy may simply lie in Noorda's hobby. Mountain climbing, especially in Switzerland, requires teamwork, and just as in networking, each climber is linked to every other. Thinking you're in that situation by yourself is potentially fatal–for everyone involved.

Dennis Peck, president of Interactive Systems, says, "Novell recognizes that what's going to keep them successful is understanding what their clients' need, delivering it, and not being a difficult company to deal with." Novell knows the contest is ongoing, adds Peck, and that Microsoft is waiting to take advantage of any misstep.

While Novell may have the PC LAN business sewn up, the rest of the world is undeniably moving toward interconnecting TCP/IP and UNIX. Novell doesn't intend to rest on its laurels. With Portable NetWare, it intends to a major player in the larger UNIX marketplace. IBM, DEC, and Sun still don't run NetWare on their UNIX platforms and without their commitment, Novell's long-term success in the UNIX marketplace has a steep climb ahead. ■



Smooth Skating Between Novell and UNIX

Avoiding a Tough Choice.
Both Novell and UNIX are important, but until now you've had to choose just one, or spend your time trying to link them with extra hardware. Now with ICE.TCP™, you can smoothly integrate Novell and UNIX (or Xenix). This simple software connection provides complete Wyse 60 or Color Console ANSI emulation and easy file transfer across most networks.

An Important Standard.
ICE.TCP is a DOS implementation of the TCP/IP protocol, a standard for inter-network communications which began with the U.S. Defense Department and has spread to academic, government, and commercial areas. ICE.TCP includes packet drivers for most network boards, and utilities which allow Novell Netware to use the packet drivers. DOS PC's can then access both the Novell server and the UNIX or Xenix host without rebooting.

Perfect with Word.
Perfect with WordPerfect.
All ICE products are fine-tuned for the best UNIX and Xenix applications. With ICE.TCP, you'll have full-featured emulation across a network connection. Serial connections are also available in ICE.TEN.

For more hard, cool facts, just call:
James River Group Inc
125 N First St Minneapolis MN 55401 USA
612-339-2521

James River Group
INCORPORATED

If you have the need to know, but still can't access the data...

Photographed at the offices of Sills, Cummis...

It's time to re-Focus.

If you need to get to your data, no matter where it's located, no matter what the format, it's time to re-FOCUS.

FOCUS, the world's leading 4GL, accesses over 40 different database and file types on 30 different platforms. That's why more than 800,000 people worldwide have chosen to use FOCUS in their multi-data environments.

UNIVERSAL DATA ACCESS MADE EASY WITH FOCUS

If you are locked into multiple, proprietary database access tools that don't talk to each other, then look to FOCUS for the flexibility you need. There is no need for extracts or format conversions. FOCUS for UNIX relates directly to your data; relational and non-relational, such as Informix, Ingres, Oracle, Sybase, Teradata, ULTRIX/SQL, DB2, IMS, Rdb, dBASE, SQL Server, and the list goes on. And FOCUS' powerful language and easy to use point and click tools enable a wide range of users to access files singly or to join them for in-depth analysis or simple reporting

FOCUS PROTECTS YOUR INVESTMENTS

Whatever your investment in hardware and database technology, FOCUS for UNIX has the convenient, flexible solution for data access. FOCUS keeps your information systems running and helps you integrate new hardware and databases. FOCUS adapts to your changing requirements.

If your data just isn't accessible, why not let FOCUS bring it to you.

Call us toll-free, at 800-969-INFO, or write Information Builders, Inc., 1250 Broadway, New York, NY 10001.

I'd like to re-FOCUS on Data Access. Please send me information on the platforms circled:

IBM AIX, Digital ULTRIX, Sun, Pyramid, Sequent, SCO, Data General DG/UX, NCR Tower & 3000, AT&T, Amdahl UTS, Hewlett-Packard HP-UX, Apollo, Bull

Name _____ Title/Dept. _____

Company _____

Address _____

City _____ State _____ Zip _____

Operating System _____ Machine Type _____

Databases Used _____

FOCUS
Information Builders, Inc.

IT'S TIME TO RE-FOCUS

800-969-INFO

(Outside the U.S. 212-736-4433, X3700)

This advertisement refers to numerous products by their trade names. In most, if not all cases, these designations are claimed as trademarks or registered trademarks by their respective companies.

CIRCLE NO. 178 ON INQUIRY CARD

CAN DEC TAKE THE RISK OUT OF RISC?

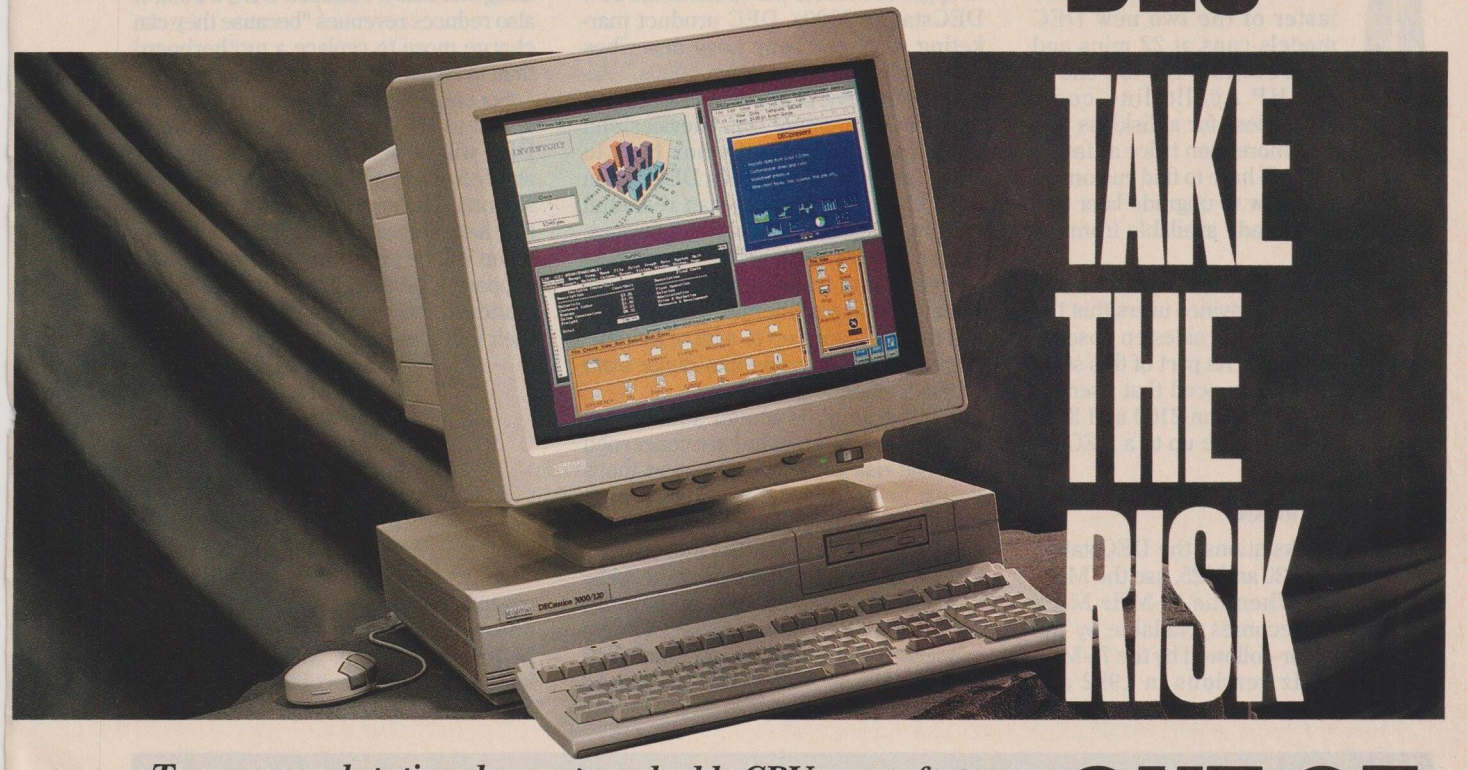


Photo courtesy DIGITAL EQUIPMENT CORP.

Two new workstations have upgradeable CPUs, so as faster RISC chips evolve, users can snap them in

Digital Equipment Corp. will ship two new workstations this June that are designed to let users increase their machine's performance by simply replacing a 3-by-5-inch daughterboard. As faster RISC chips become available, users can unplug their current daughterboard and substitute one with the newer, faster implementation of the CPU. The goal is to get the power of a new machine without having to buy a whole new workstation.

Board swapping is not a new idea. Today, PC users can substitute motherboards holding Intel's 386 chips with those holding 486 chips. Minicomputer vendors have offered board swaps for years. But DEC is the first workstation vendor to make a concerted effort toward selling replaceable boards rather than replaceable boxes. This

BY HOWARD BALDWIN

strategy seeks to allay the fears of people who don't want to see their expensive purchases become technologically obsolete before the one-year warranty is up.

DEC's CPU-swapping strategy brings up a lot of questions, however. Workstation performance is comprised of more than the speed of the CPU. I/O and memory cannot remain static when the CPU is upgraded.

An even bigger challenge is the blindside hit delivered by Hewlett-Packard Apollo's new Series 700 workstation. The faster of the two new DEC models runs at 22 mips and costs $12,995. The low-end of the HP Apollo line costs $1,000 less for a diskless version and runs more than twice as fast at 57 mips. DEC will have to find customers willing to pay now to upgrade later to a speed that's already available from another vendor.

Because it's been finessed on speed, DEC's goal is to convince users that the ability to upgrade and sidestep obsolescence is important. As part of this strategy, DEC has announced that users of its low-end DECstation 2100 and 3100 workstations can trade up to a DECstation 5000.

The RISC Parade

The new workstations, the DECstation 5000 Models 120 and 125, use the MIPS R3000 chip. When the 50-MHz MIPS R4000 chip becomes available by the end of this year–followed by the 75-MHz and 100-MHz versions in 1992 and 1993–customers will use them to increase processing power for less than it would cost to buy a new workstation, according to DEC. Officials would not reveal the anticipated cost of an upgraded daughterboard, other than to say that it would be less than $5,000.

That's only part of DEC's upgrade strategy. It is discontinuing the 2100 line and will re-price the 3100 at $4,995. DEC says it has already sold 60,000 to 70,000 RISC workstations.

Users of those machines can buy a kit to upgrade them to the speed of the new DECstation 5000s. DEC product marketing manager Tony Levy describes the kits as "stripped-down 5000s." According to Levy, customers can remove the memory, monitor, input devices, and disk drives, and give the box back to DEC. In return, they'll get a DECstation 5000 box in which they can re-install their input, output, and storage devices. "The customer's initial investment is in software, and their next [biggest] investment is in peripherals," claims Levy. "All this stuff adds up to a lot of money." Prices for the upgrade kits range from $3,995 to $5,995.

This strategy is aimed squarely at "middle managers [who] are concerned with the risk of buying a system that's going to be obsolete in six to nine months," asserts Levy. Their budgets don't allow them to buy the most powerful systems, regardless of price, he adds.

Are corporate middle managers, DEC's admitted target group, always concerned with speed, or just efficiency? Andrew Allison thinks DEC has tapped a nerve in the user community. "When processors significantly increase in performance every six months, customers get leery," says Allison, editor of the *RISC Management* newsletter. "DEC has decided that the speed of RISC development is so great, they need the added flexibility."

Nevertheless, if DEC is hoping to introduce RISC machines to desktops that haven't had one before, its upgrade strategy faces an uphill battle on three fronts. First, notes Allison, while producing a daughterboard reduces DEC's cost, it also reduces revenues "because they can charge more to replace a motherboard than to replace a daughterboard."

Second, it's already lost the battle for speed to HP. Finally, before too long, DEC will be assaulted on the upgradeability front by SPARC-compatible workstations. The semiconductor companies that have licensed the SPARC implementation will be producing daughterboards supporting SPARC International's MBus standard, so their users can upgrade their CPUs as well.

Meanwhile, MIPS chips are available from several semiconductor houses, just as Sun's are. The difference is that, for the most part, the SPARC chip manufacturers are doing their own implementations, while the MIPS chip manufacturers are simply acting as second-sources, using the "recipe" that MIPS sends them. MIPS plans to release faster versions of the chips once a

Running Against the Sun...and More

With its new systems, DEC is trying to position itself against the current market leader, Sun Microsystems. DEC is comparing the Model 120 with the SPARCstation IPC, and the Model 125 with the SPARCstation 2. The pricing is competitive and the DEC models offer more storage, but fall between the Sun machines in terms of performance. When compared to similarly priced machines from IBM and Hewlett-Packard, the Model 125 is somewhat slower than the IBM RS/6000 Model 320 and significantly slower than the diskless HP Apollo Model 720.

	SPARCstation IPC	DECstation Model 120	DECstation 5000 Model 125	SPARCstation 2	IBM RS/6000 Model 320	HP Apollo Model 720
Price (monochrome)	$7,995	$7,995	$12,995	$14,995	$12,995	$12,990
mips	15.8	18	22	28.5	27.5	57
SPECmarks	10	12*	15*	21	22.3	55.5
RAM (megabytes)	8	8	16	16	8	16
Internal Storage (megabytes)	207	329**	418**	207	120	diskless

*DEC anticipates that with new compilers, these SPECmarks will increase to 14 and 17, respectively.
**An installed CD-ROM reader is available in place of a floppy disk.

year. Users of SPARC-compatibles, meanwhile, may be able to pick and choose boards from at least four semiconductor vendors. If history repeats itself, these vendors will leapfrog each other every few months. Even worse for DEC, Sun estimates that the cost of an MBus daughterboard will be between $2,000 and $3,000.

Beyond mips

As mentioned, there is more to a workstation than its mips rating. T. Michael Nevens, a principal with management consultant firm McKinsey & Co., says that an upgradeable daughterboard is a good idea, "assuming there are no tradeoffs elsewhere on the system." But tradeoffs would occur in memory and I/O. Depending on your application, and the ultimate speed of the processor, you'd want to add more RAM and have as fast a bus as possible. The result is a balanced system, something DEC keeps insisting is crucial.

According to product marketing manager Levy, the new machines address this problem solely with "excess capacity" in two features: the ability to upgrade the RAM and the speed of the DECstation's bus, the TurboChannel. According to Levy, RAM can be increased up to 128 megabytes using four-megabit single in-line memory modules (SIMMs), or up to 32 megabytes using one-megabit SIMMs. This strategy isn't significantly different from workstations on the market today: you can upgrade the low-end IBM RS/6000 with up to 32 megabytes of RAM, and you can upgrade up to 96 megabytes of RAM in a SPARCstation 2.

As for the TurboChannel I/O bus architecture, DEC clocks it at a 43-megabyte-per-second (Mbps) sustained transfer rate. This compares to the sustained rate of 40 Mbps for the VMEbus, and 36 Mbps for the SBus. The DECstation 5000 line has three expansion slots, as does the SPARCstation. A faster transfer rate is fine in theory, but in practice DEC is still running to catch up. While DEC, like Sun, offers the specifications of the bus architecture at no charge, only 20 of 135 manufacturers in the TurboChannel program have shipped products utilizing it. By comparison, Sun lists 186 SBus boards currently shipping from 89 different vendors.

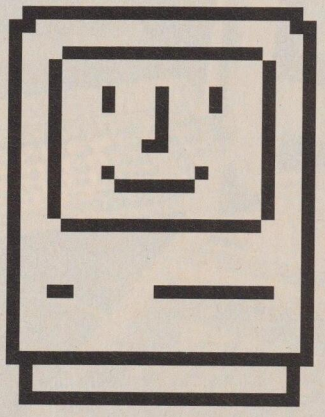
Lowering the Hurdle

Can DEC take the risk out of RISC? It's possible, if it can attract users that aren't already devotees of speed.

McKinsey's Nevens says he sees customers regularly struggling with the issue of when they can afford to roll over their installed base to get better performance. He thinks the idea of an upgradeable daughterboard will be well received "if this lowers the hurdle, so that instead of spending $20,000 for a whole box, [they're spending] a significant fraction of that cost to keep their users supplied with better performance."

What will undoubtedly bedevil DEC, though, is the possibility that users looking for speed will be lured by the new HP Apollo machines, while users looking for the most options in upgradeability will be lured by the SPARC-compatibles. ■

MEET YOUR NEW UNIX SYSTEM ADMINISTRATOR!



Helios' EtherShare™ file server system lets you do system administration from any Macintosh on your network. Plus it gives you a PostScript® print server, a terminal server and an internet router that uses AppleTalk packet technology. *All for about $100 per session!*

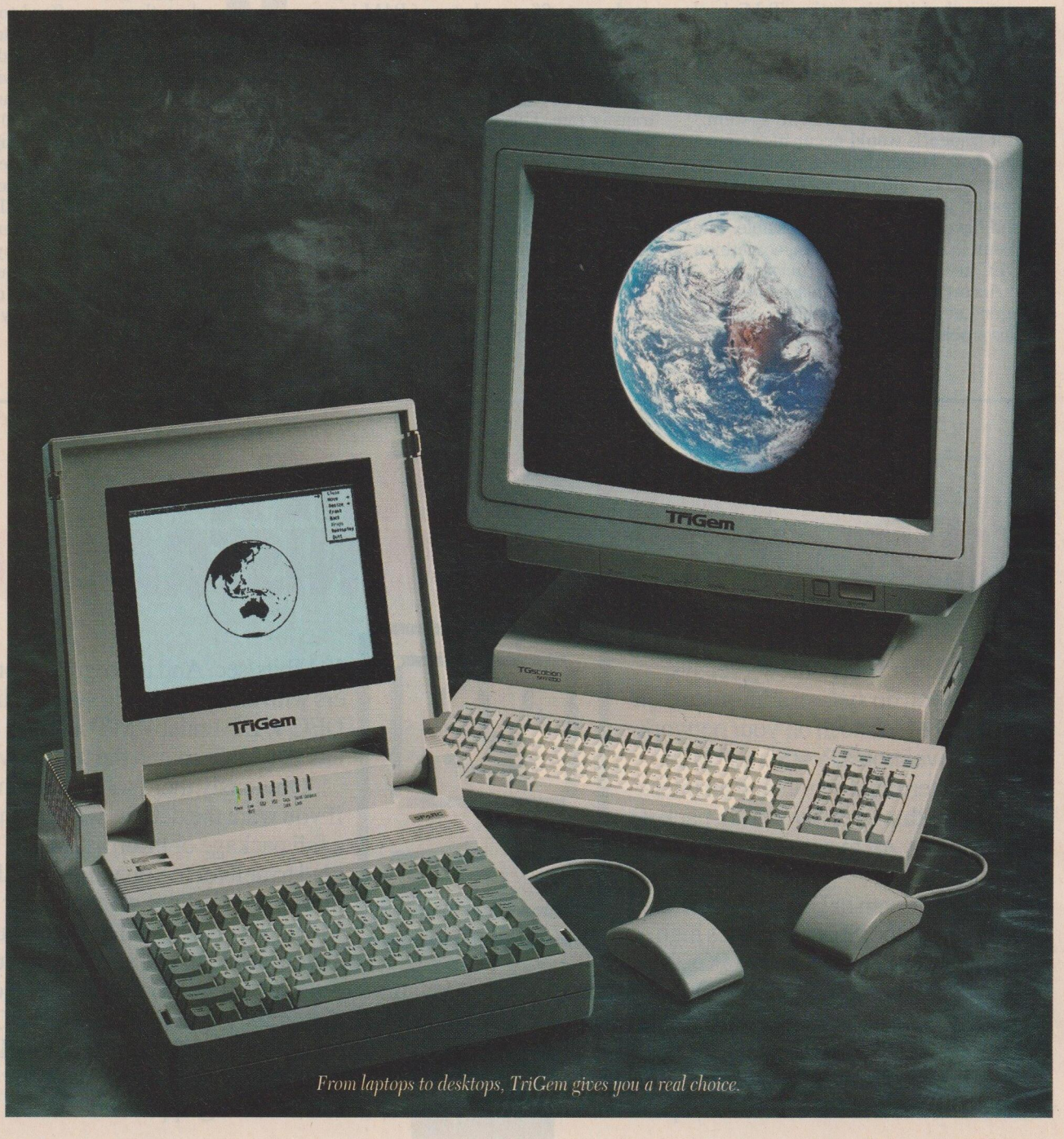
Field proven in Europe for almost two years, EtherShare provides high speed file access to up to 200 PCs, Macs and your DEC, Sun, Sony or IBM workstations. You can even have several EtherShare systems working on the same Unix host at the same time. It looks like AppleShare to the Macs, but moves data at Ethernet rates, up to 10 Mbits/sec. And it integrates computers with other operating systems like a DEC VAX® under VMS or Ultrix and lets IBM PCs join in the fun, as well.

Obviously there's a big story here. If you want the details, we've prepared a full package of information we'll be glad to deliver to you via e-mail. Just dial up our CompuServe® number 74730, 1004 and we'll get it to you. If you would like to speak with our National Sales Manager, contact Paul Lucero at 998 West Lynn Way, Suite 4, Cupertino, CA 95014. Phone 408-255-2503. AppleLink: Helios.USA; or send him e-mail on Internet: lucero@apple.com.

HELIOS

CIRCLE NO. 23 ON INQUIRY CARD

To Create The World's B
It Took Both



From laptops to desktops, TriGem gives you a real choice.

TriGem locations: TriGem Corporation, 6815 Flanders Drive, San Diego, CA 92115; Tel 619-587-9722; Fax 619-587-9694. TriGem Computers (U.K.) Ltd., 68 Buckingham Ave., Slough Trading, Estate Slough, Berkshire SL14PN; Tel 0753-810808; Fax 0753-810807. Tel 06173-640066-9; Fax 06173-61703. TriGem Computer Inc., 784-6 Kisung B/D Yeoksam-dong, Kangnam-gu, Seoul, Korea; Tel 02569-1701, 02569-1196; Fax 02561-0364. ©1991 TriGem Corporation. All brand names and products are trademarks or

est SPARC-Compatibles, Hemispheres.

Introducing TriGem Corporation. We're putting SPARC™ technology right where you want it. On your desk. And in your lap.

TriGem, Korea's largest computer manufacturer brings together the best of both worlds with this superior new line of SPARC workstations. Workstations that are jointly designed and developed with San Diego-based RDI Computer Corp., a leader in SPARC technology. This unique partnership of manufacturing and design gives you the best workstations for both sides of your brain.

For the creative side, TriGem offers a completely new approach to software compatibility. Our laptop and desktop both run SunOS™ 4.1. So you have access to over 2,000 SPARC programs. And with RDI Computer Corp.'s optional Companion™ software, they're also 100% compatible with Macintosh® applications. This opens up a completely new world for you.

We also give you total portability. The SLT-100™ is the only SPARC-compatible laptop that's battery-powered, so you can actually use it while you travel.

For the logical side of your brain that wants superior performance, the SLT-100 gives you 12.5 MIPS, 1.6 MFLOPS, and 8.3 SPECmarks. There's also 8 - 48 MB DRAM and a 120 MB hard drive. Along with built-in Ethernet and SCSI interfaces, available are two serial ports, audio, and two SBus slots.

Even our proprietary display is more than you'd expect in a portable. The SLT's revolutionary backlit LCD has 640x480 resolution giving you clear, crisp imaging under all conditions for running any SPARC-compatible software.

And that's just our laptop. We also designed our SDT-200™ desktop system for both sides of your brain. At 20 MHz, its SPARC CPU will deliver 12.5 MIPS, 1.6 MFLOPS, and 8.3 SPECmarks. With 1152x900 resolution, TriGem's 20", 256-color display gives you the image quality you need for 3-D wireframe drawing and even solids modeling.

To support large scale applications, there's a built-in 205 MB hard drive, 8 - 48 MB DRAM, and an optional 150 MB tape drive. TriGem's SDT-200 also gives you a full line of built-in software, including SunOS 4.1, networking software, SunView™, and the X11 windowing system. Our desktop will also support Ethernet™ communication standards such as NFS/ONC and TCP/IP.

And we give you all this in a desktop package that's only 2.8" high and 15" square. But with all this technology, and all this performance, our desktop starts at only $8,650. And our laptop starts at only $9,900. So the left side of your brain can call this a purely rational decision.

To find out more about these innovative new systems, call 619-587-9722 or fax us at 619-587-9694. We'll send complete information.

And we'll show you workstations that make perfect sense for both hemispheres. Because that's exactly where they come from.

TriGem

TriGem Computer GmbH, Hauptstraße 350 D-6263 Eshborn, West Germany; registered trademarks of their respective holders.

CIRCLE NO. 204 ON INQUIRY CARD

OUT OF THIS WORLD PRODUCTS, DOWN TO EARTH PRICING.

Terminal Servers for Unix

The newly launched Chase IOLAN is a terminal server for large Unix multiuser and networking systems. IOLAN picks up where multiport boards leave off. It provides increased expandability and terminal/host distances of one mile!

IOLAN simply attaches as a node on any Ethernet system running TCP/IP–no slots, no drivers.

With IOLAN, each user can access up to any four hosts at one time.

A unique menu-driven interface allows easy operation of all 16 ports.

IOLAN is the next wave of Unix multiport solutions. And for price and performance Chase is the leading choice.

For information on pricing in your part of the universe, call

615-872-0770

or the Chase office nearest you.

Chase Research, Inc.
545 Marriott Drive
Suite 100
Nashville, TN 37210
615-872-0770
615-872-0771 (fax)

Chase Research PLC
Chineham Business Park
Basingstoke, England
Hants RG24 OWD
(44) 256 52260
(44) 256 810159 (fax)

Chase Research GmbH
Zettachring 6
D-7000 Stuttgart 80
West Germany
(49) 711 7287155
(49) 711 7287156 (fax)

CHASE RESEARCH

Connect with the future

CIRCLE NO. 220 ON INQUIRY CARD

INTERVIEW:

Walter De Backer

Director of Informatics, European Commission

One of the Most Influential Users in the Industry Talks About His Role in Open Systems

Edited by Gary Andrew Poole

As the most influential open systems user in Europe, a lot of people–vendors and users–want Walter De Backer's predictions, views, and plans. De Backer is the director of informatics for the European Commission, the administrative body of the European Economic Community, which means any company or government that is part of the EC can be influenced by his recommendations.

In 1980, the European Commission decided to follow a vendor-independent architecture based on standards. Today, UNIX and MS-DOS now account for 87 percent of the operating systems used on equipment in Europe's departmental systems. In 1989, the EC incorporated specifications for the mainframes of the computing center in the migration process to open systems.

Today, De Backer's organization continues to implement open systems and is one of the largest buyers of open systems in Europe. At the EC, he is responsible for the information systems supporting the EC's policies, an estimated $80 million annual budget, and more than 500 employees who report to him.

De Backer started his career in 1962 as a researcher in applied mathematics and computing. In 1966 he started at International Telephone and Telegraph where his responsibilities were similar to that of his current position with the EC. In 1981 he was recruited to become the EC's director of informatics.

De Backer also lectures at the University of Ghent where he is a professor in information systems management.

We were interested in De Backer's thoughts about today's open systems movement in Europe, the user movement, and his philosophical ideas about open systems. *UNIXWORLD*'s Executive Editor Dianne Jacob and Features Writer Gary Andrew Poole conducted the interview.

continued

JOSH GOSHFIELD

UNIXWORLD: Do you think the European Community is in a leadership position in the open systems movement?

De Backer: Without false modesty, I think so.

UW: The European Community will strip away all intercountry barriers in 1992. This is right around the corner. Do you think that the open systems movement is progressing well, and how does your organization play into 1992?

WD: The challenge is to accelerate the development of new and redesigned information systems to provide support for the construction of the European Community within a rapidly changing political environment.

UW: If the removal of trade barriers in 1992 was not to happen, do you think UNIX and open systems would advance as quickly in Europe as they have?

WD: Yes, because the market forces are requiring open systems; it's not a policy decision–the market forces the move to open systems, not the government. Users want open systems.

UW: So it's the same as in the United States?

WD: Absolutely. That's the only way it ought to be. Users need open systems for their own selfish interests. The user enterprise is forced now to think in strategies. The impact of rethinking these strategies is that the present information system is obsolete before the end of its life cycle. Therefore we are faced with the terrible challenge of redesigning many information systems in a very short time. That will cost manpower and time. The only way to do that more quickly is to have the industry deliver more building blocks.

UW: How does that contrast with the need to protect users initial investment?

WD: You're stuck with a proprietary environment investment that has been made in the past. You cannot remake history, but in a certain time you have to redesign your information systems. Then you must take the opportunity of protecting that new investment for the future.

UW: Are you saying that it's more practical to redesign on a departmental basis rather than redesign the entire enterprise?

WD: In the case of the Commission, the development of departmental systems was done with open systems. We have not [made] major investments in proprietary systems. We took right off on open systems there. This is not the case with the mainframes and this is a second phase we have to tackle now. In the Commission, departmental systems have been implemented since 1984. The decision to go for open systems in the computing center was made in 1989.

UW: Do you think UNIX is valuable on a mainframe?

WD: We have had bridges to the existing mainframe right from the beginning.

UW: What about a UNIX mainframe?

WD: We are now implementing UNIX mainframes. The objective is to make the proprietary [environment] disappear. Slowly and carefully, but make it disappear.

UW: Is that realistic for other companies?

WD: I don't know. Today UNIX is not ready for them, but within two years–when problems like security are solved–I think everybody could start that migration and get out of proprietary systems. Now the question is, in five years time, what will be proprietary systems? If MVS [IBM's mainframe operating system] complies with standards then it's not a proprietary system.

UW: That's a fascinating argument. George Shaffner [chief marketing officer] from X/Open makes the same one. He says that by 1995 standard proprietary operating systems will have 75 percent of the market.

WD: Fundamentally I don't disagree with that. The problem is that "proprietary" is the wrong word, but you can't use another word because no one will understand what you mean.

UW: According to Mr. Shaffner, users will be thrilled by this development because it means they can go back to one vendor and to service and support that they can understand.

WD: I hesitate a bit. What the user always will need is the possibility of replacing a supplier with a better one. That's also the best condition to stay with the same supplier for many years. If a user can't change a supplier, then it is wrong–if a user can change then it is right. That is the criteria. Our goal is not standardization, because that's only a means to an end. What one wants is open systems and that means portability, interoperability. So that you can protect your investments and that you're not locked into any supplier. That's the basic criteria.

The challenge is to accelerate to the development of new and redesigned information systems

UW: What is your annual budget for systems?

WD: 80 million ECU [1 ECU = $1.3 U.S.]. What does that figure mean? It includes all expenditures–service, training, telecommunications, workstations, etc. It does not include personnel costs.

UW: Have you standardized on a particular architecture, or a particular vendor?

WD: No. [With] desktop machines, which are our major investment now, we see that the majority of our suppliers

MultiNet™ "A Must For Sites... Running VMS® And UNIX®"*

MultiNet–"...more than enough UNIX networking capabilities..."
**Digital Review, 12/10/90*

up to 100% of the value of your current board or host-based TCP/IP implementation toward your MultiNet purchase.***

There's only one VMS-UNIX connectivity solution that's guaranteed to be easy to install, is recognized for its quality, and includes superior support. That's why Digital Review found MultiNet TCP/IP, NFS Client and Server to be "...more than enough... to enable communications between VMS nodes and any UNIX network."

MultiNet–"Feels as if it were designed for VMS (connectivity) from the ground up."
Dec Professional, 3/91

Clearly, MultiNet's flawless design features earned us this accolade. Designed-in quality means lower maintenance fees – as much as 50% less than what you're paying today. And with your MultiNet software maintenance agreement, you also get up to six months of free support.**

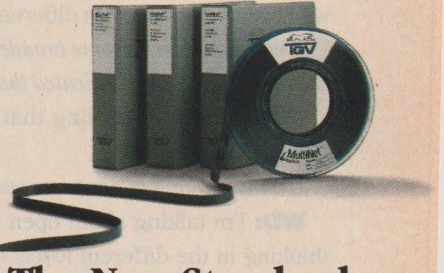
MultiNet–"The manual was excellent... the software remarkably easy to install and set up."
Digital Review, 2/10/90

An excellent manual and easy installation makes your MultiNet decision even easier. Now add a 30-day FREE evaluation and apply

"Go with TGV–Not only is the product great... the support is even better."
Rich DeJordy, DECUS U.S. Chapter Newsletter, 1/91

Guaranteed support and quality. No wonder MultiNet received Digital Review's Editor's Choice award. That's what you would expect from the team of experts who implemented the first TCP/IP for VMS, the first VMS NFS Server, and the world's first NFS Client for VMS. And with this same team supporting MultiNet, no support request goes unanswered. We guarantee it! MultiNet is a "must" for your VMS-UNIX site. So call TGV toll-free today.

1-800-TGV-3440



TGV™

Destined To Be The New Standard.

**If your TGV annual support agreement is signed within 60 days after the purchase of MultiNet, an additional 90 days will be added to the standard 90 days which are included with every new license – a total of six months of free support.
***Not to exceed 50% of your MultiNet license fee. TGV and MultiNet are trademarks of TGV, Inc. VMS is a registered trademark of Digital Equipment Corporation. UNIX is a registered trademark of AT&T.
TGV, Inc., 603 Mission St., Santa Cruz, CA 95060. Tel (408) 427-4366. FAX (408) 427-4365. ©1991 TGV, Inc.

CIRCLE NO. 158 ON INQUIRY CARD

have chosen Intel. This is again not our choice, but their choice.

UW: What is your choice?

WD: We don't choose. We make our vendors choose. We make our specifications on a higher level. We judge their computers, but not their technology.

UW: So they've chosen Intel with SCO UNIX?

WD: To a large extent, yes. That includes the European and American suppliers.

UW: What about at the server level? Do they want to have a DOS-UNIX front-end and UNIX servers?

WD: Yes, but the final selection for database servers is not completed. In terms of operating systems, UNIX System V.4 is all right for us, but if OSF/1 comes along, then that is all right for us as well. For the desktop we have SCO, and for the database server UNIX V.4.

But what we're going to start, contractually with the vendor, is no vendor-specific added value functions. So no Siemens or Bull or DEC [Digital Equipment Corp.] UNIX, even if they all comply with XPG3 [X/Open Portability Guide 3]. We will stick with SCO, UNIX System V.4, and perhaps OSF/1 and nothing else.

UW: You're a large customer, but what if you were an eight-person company and you said that? The vendor would laugh.

WD: Yes, that's true [laughs], but if I was a small company I would only buy from those that would guarantee that.

UW: So if you were a small company you would probably standardize on networked 386s. Right?

One is trying to make a common denominator. . . a stable layer between technologies

WD: That's it.

UW: Maybe a server from NCR because it's Intel-based?

WD: Exactly. What I'm doing is not possible for a small customer, but a small customer doesn't have the problems that we have in working with different suppliers.

UW: Let's move to some broader issues. Do you think users in Europe are more sophisticated than users in the United States?

WD: I have the feeling that in Europe open systems is farther along.

UW: What kind of advances over the United States?

WD: I'm talking about open systems. There's been more thinking in the different levels of management. In my native country of Belgium, for instance, I see everybody in the government, as well as private industry, has a clear concept of why they need open systems. These people are struggling with how to implement it.

UW: Are European vendors more advanced than American vendors in open systems?

WD: A European user's view of open systems is more advanced, but this gives the same opportunity for all vendors in Europe.

UW: Do you think OSI [Open Systems Interconnect] had something to do with the advancement of open systems in Europe over the United States?

WD: OSI has a long tradition in Europe because of telecommunications, but whether that is decisive I don't know.

UW: Do you think the United States will catch up?

WD: The United States is catching up fast. It always depends on whether you're talking about the vendor side or the user side. U.S. vendors are on the leading edge, there's no doubt about that.

UW: How about the Japanese vendors? E.G. Unwin, chairman of the Hoskyns Group plc [one of the largest system integrators in Europe] says that while American manufacturers still have the largest market share in Europe, the Japanese will change that in a few years. Do you agree with that? Do Japanese companies come to you wanting you to buy their products?

WD: No.

UW: Do they just buy percentages of the other companies coming to sell you products?

WD: That's how it is.

UW: What are your views on architecture-neutral distributed format (ANDF) from the Open Software Foundation (OSF)?

WD: I am not a technician. I have no feet to stand on to say, "This is wrong, this is right." My intuition says this is a terrible problem to try and solve. If I see it solved I will have admiration for those that solve it, because intuitively what one is trying to do is make a common denominator: find a stable layer between a variety of technologies. For god sake, the competition drives those technologies in an unpredictable way...I'm skeptical.

UW: You're not opposed to a SPARC machine running System V.4 are you?

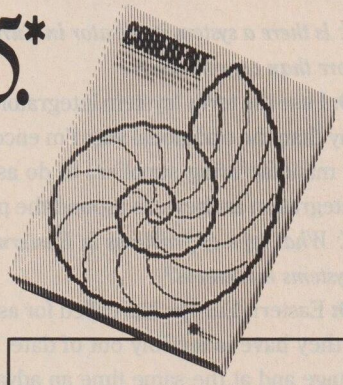
WD: No.

UW: Just because they've standardized on Intel at the front-end doesn't mean you can't have RISC-based servers.

WD: No, no. We don't know how far the success of the present 486 will go in parallel processing. We are not going to standardize on technologies because we're indifferent. We're interested in what our vendors do, of course. But we're looking at this from a higher level.

continued

Everything You Ever Wanted In UNIX. And Less. $99.95.*



NEW COHERENT RELEASE 3.1
NOW WITH...
- –elvis: vi editor clone
- –SCSI (Adaptec AHA 154x series and more on the way.) and ESDI support
- –UUCP Bulletin Board System
- –RAM disk support
- –And much, much more!

OVER 10,000 SATISFIED USERS!

OK. We know it's hard to believe. So just consider this. Coherent™ is a virtual clone of UNIX. But it was developed independently by Mark Williams Company. Which means we don't pay hundreds of dollars per copy in licensing fees.

What's more, Coherent embodies the original tenet of UNIX: small is beautiful. This simple fact leads to a whole host of both cost and performance advantages for Coherent. So read on, because there's a lot more to Coherent than its price.

SMALLER, FASTER...BETTER.

Everybody appreciates a good deal. But what is it that makes small so great?

For one thing, Coherent gives you UNIX capabilities on a machine you can actually afford. Requiring only 10 megabytes of disk space, Coherent can reside with DOS. So you can keep all your DOS applications and move up to Coherent. You can also have it running faster, learn it faster and get faster overall performance. All because Coherent is small. Sounds beautiful, doesn't it?

But small wouldn't be so great if it didn't do the job it was meant to do.

LESS IS MORE!	Coherent For the IBM-PC/AT and compatible 286 or 386 based machines.	Santa Cruz Operation's XENIX 286, Version 2.3.2
No. of Manuals	1	8
No. of Disks	4	21
Kernel Size	64K	198K
Install Time	20-30 min.	3-4 hours
Suggested Disk Space	10 meg	30 meg
Min. Memory Required	640K	1-2 meg
Performance*	38.7 sec	100.3 sec
Price	$99.95	$1495.00

*Byte Execl benchmark, 1000 iterations on 20 MHZ 386. Hardware requirements: 1.2 meg 5¼" or 1.4 meg 3½" floppy, and hard disk. Does not run on Microchannel machines.

EVERYTHING UNIX WAS MEANT TO DO.

Like the original UNIX, Coherent is a powerful multi-user, multi-tasking development system. With a complete UNIX-compatible kernel which makes a vast world of UNIX software available including over a gigabyte of public domain software.

Coherent also comes with Lex and Yacc, a complete C compiler and a full set of nearly 200 UNIX commands including text processing, program development, administrative and maintenance commands plus UUCP.

CRITICS AGREE: IT'S AN INCREDIBLE VALUE!

"Mark Williams Co. seems to have mastered the art of illusion; Coherent comes so fully qualified as a UNIX clone, you find yourself thinking 'I can't believe it's not UNIX.' "

–Sean Fulton, UNIX Today!, November 26, 1990

"...(Coherent) may be the best thing that has happened to UNIX yet."

–William Zachmann, PC Week, November 5, 1990

"If you want to come as close as you can to real UNIX for a low price, COHERENT can't be beat."

–Warren Keuffel, Computer Language Magazine, November 1990

"If you want a UNIX-like development and learning system for less than $100...I don't see how you can go wrong with Coherent."

–David Fiedler, BYTE Magazine, November 1990

EXPERIENCE, SUPPORT AND A 60-DAY MONEY BACK GUARANTEE.

Wondering how something as good as Coherent could come from nowhere? Well it didn't. It came from Mark Williams Company, people who've developed C compilers for DEC, Intel, Wang and thousands of professional programmers.

We make all this experience available to users through complete technical support via telephone. And from the original system developers, too!

Yes, we know $99.95 may still be hard to believe. But we've made it fool-proof to find out for yourself. With a 60-day money-back no-hassles guarantee.

You have to be more than just a little curious about Coherent by now. So why not just do it? Pick up that phone and order today.

You'll be on your way to having everything you ever wanted in UNIX. And for a lot less than you ever expected.

1-800-MARK WMS

(1-800-627-5967 or 1-708-291-6700)
FAX: 1-708-291-6750
60-DAY MONEY BACK GUARANTEE!

Mark Williams Company
60 Revere Drive
Northbrook, IL 60062

*Plus shipping and handling. Coherent is a trademark of Mark Williams Company. UNIX is a trademark of AT&T. XENIX is a trademark of Microsoft.

UW: Is there a system integrator in Europe that you use more than anyone else?

WD: I use the term "system integrator" in a different way than the traditional way. I'm encouraging all of our manufacturing suppliers to do as much system integration as they can around the products.

UW: What type of problems is Eastern Europe facing in the open systems movement?

WD: Eastern Europe has called for assistance from the EC. What they have is terribly out of date. This is a terrible disadvantage and at the same time an advantage too. They have no burden of the past. There is a lot of interest in open systems. They are asking for lists of standard specifications. They can simply start with open systems. No migration.

UW: Wouldn't IBM just go in there and sell mainframes to them?

WD: Did you hear Armstrong [C. Michael Armstrong, chairman and president of IBM World Trade Corp., who gave a speech at UniForum about IBM's commitment to open systems]?

UW: He only makes that speech at UniForum doesn't he? He makes a completely different speech at other conferences.

WD: [Laughs]. He was honest. If you're with IBM UNIX you want like hell to get your UNIX machines in there.

UW: The mainframe team is larger. Wouldn't they get there first?

WD: I suppose so. For the moment, the users are going to the big supplier.

UW: Do they have money for mainframes?

WD: It depends on the cases. But the interest in open systems is very important.

UW: There's interest, but there's such a lack of money. Do you think it's going to take them a long time to move into open systems?

WD: There's a lot of ground work to be done.

UW: Telecommunications groundwork?

WD: No. Business relations. The way of doing business–what is built into the mind automatically–they don't have the normal reflex action.

UW: If these countries join the European Community will you help them?

WD: We are already involved with helping them now. Not my organization, but there is a completely new part of the organization in the Commission–a task force that helps with investment, banking, everything.

UW: Now tell us about the user movement. We know you had a meeting at UniForum in January.

WD: At the meeting with all the different user organizations there was an absolutely unanimous feeling that the major obstacles in fact are not technical, but organizational.

Afterwards I read different reactions from the press. There is some kind of expectation from the press about how users are coming together and going on the offensive [against vendors]. They want us to be like that, but there is not a feeling like that at all [with the user organizations].

Our three priorities are: improving the knowledge on all levels of the enterprise, accelerating standardization to accelerate the number of products that are interoperable, and users deciding on the way that they are going to communicate their user requirements to the industry.

UW: Let's look at it from the manufacturer's point of view, what if 10 user groups have 10 different sets of standards. What are you supposed to do if you're a vendor?

WD: The meeting was precisely to bring together the 13 user organizations.

UW: And they're all going to interoperate?

WD: Yes. The meeting started in an informal way. I asked that each person list the three main problems that needed to be solved. It didn't take more than a one-and-a-half hour discussion to come to the consensus of three that everybody agreed on.

UW: Who orchestrated this meeting?

WD: We hosted the meeting. The X/Open user council together with UniForum.

UW: Is there anything else you would like to add?

WD: Just a brief story. One day I made a trip to the United States. On the way back, someone said "You should pass by the Bell Labs and ask for [Dennis] Ritchie. You should go and see him, they have UNIX there, it might be something that you like." This was in 1976. I went there and he showed me everything in 2 hours.

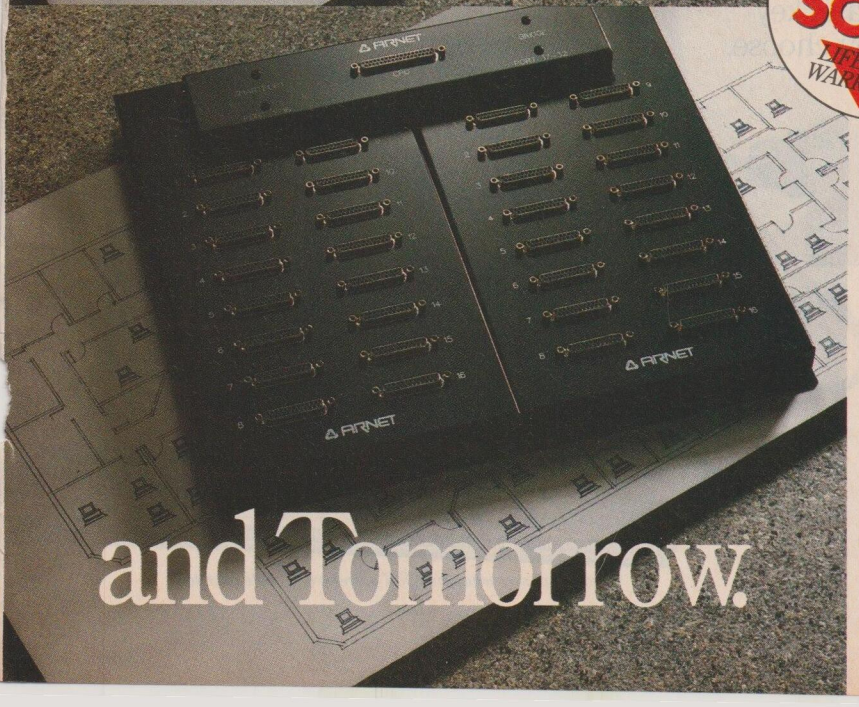
And I said, "Do you have documents?"

"Yes," he said. And on the airplane I read them. I bought a UNIX system in 1976.

So we started. They said they would come and install it on the weekend. And I said, "Oh what an idea! Launching an operating system. That takes two or three weeks!"

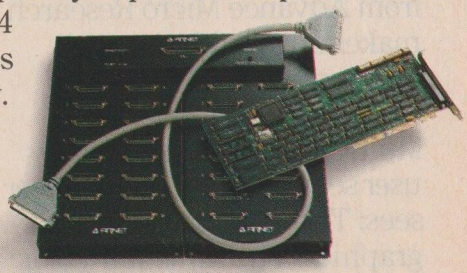
During the weekend when it was being done I said to myself, "I've got to see how this is coming." I came in and they were all sitting there eating. I said, "When are you going to start?" and they said, "It's done." ■

Eastern Europe has no burden of the past. They can simply start with open systems



Time waits for no one. That's why a multiuser board should be able to keep up with the need to add people and resources. Arnet's new Smartport™ board makes it easy.

With one Smartport board, a system that started with 8 serial ports yesterday, can quickly expand to 16 ports today and 24 or 32 ports tomorrow. All in one slot. Just by adding an external DB-25 intelligent box. It's that easy.



Smartport makes keeping up with performance easy, too. Because its 16 MHz 80C186 processor keeps applications and people humming along at top speed.

Plus, system downtime will become a thing of the past. Because Smartport is built with Arnet's renowned reliability that includes SurgeBlock,™ the industry's only on-board surge protection. Backed by Arnet's Rock Solid Lifetime Warranty. Overnight product replacement. And the best customer service in the business.

And, like Arnet's entire line of multiuser boards, Smartport is compatible with all popular multiuser operating systems. Whether it's UNIX®, multiuser DOS or any other widely used multiuser environment, Smartport will integrate effortlessly.

ARNET ROCK SOLID™ LIFETIME WARRANTY

So make it easy on yourself to keep up with the future. It's simple with Smartport. Call Arnet today at **800-366-8844**. Then time will be on your side.

ARNET

618 Grassmere Park Dr. #6
Nashville, Tennessee 37211
615-834-8000

Come Visit Us At European Unix in London, Booth #292

©1991, Arnet Corporation. All rights reserved. Arnet and the Arnet logo are federally registered trademarks and Smartport and SurgeBlock are trademarks of Arnet Corporation. UNIX is a registered trademark of AT&T Bell Laboratories.

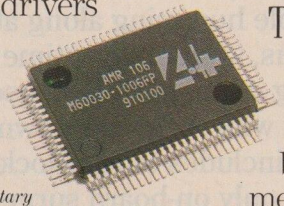
CIRCLE NO. 189 ON INQUIRY CARD

MultiConsole solutions make

A MultiConsole™ solution from Advance Micro Research makes any multiuser application more attractive.

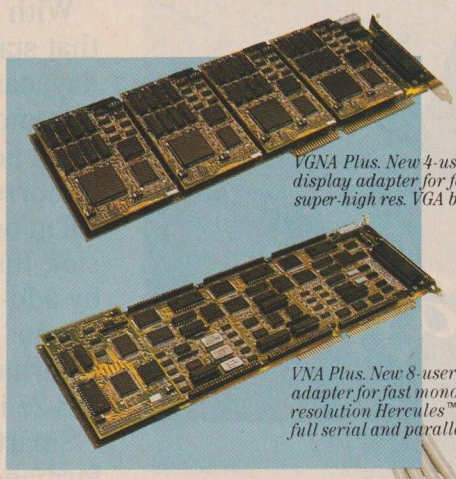
Because with a MultiConsole solution, every user sees what the console user sees: The same fast text and graphics. The same full-color graphics. The same multi-screen capabilities for multitasking.

All with no need to write dumb terminal drivers that don't produce the result you want anyway.



Proprietary VLSI technology speeds throughput and enhances performance.

So you'd expect to pay more, right? Here's the best news of all.



VGNA Plus. New 4-user color graphics display adapter for fast VGA text and super-high res. VGA bit-mapped graphics.

VNA Plus. New 8-user graphics display adapter for fast monochrome text and high-resolution Hercules™ bit map graphics with full serial and parallel support.

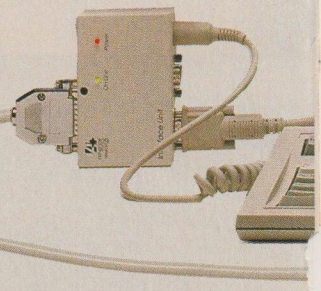
COSTS LESS THAN DUMB TERMINAL SOLUTIONS.

MultiConsole solutions cost less than even the dumbest terminal-based solutions. Not to mention "intelligent serial I/O" solutions or any other terminal-based solution.

Because MultiConsole solutions are based on our UnTerminal™ Multi-station Adapters.™

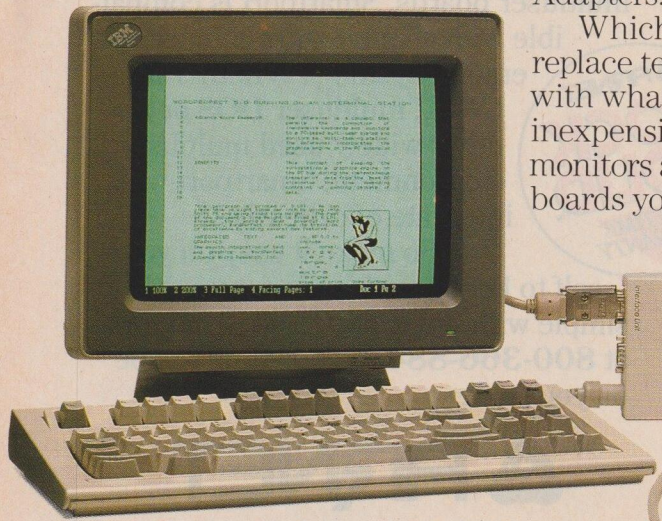
Which allow you to replace terminals with whatever inexpensive PC monitors and keyboards you choose.

While the resulting UnTerminal stations use our proprietary VLSI technology to deliver full console performance at top speed—and give every user all the ANSI-standard capabilities of the console user.

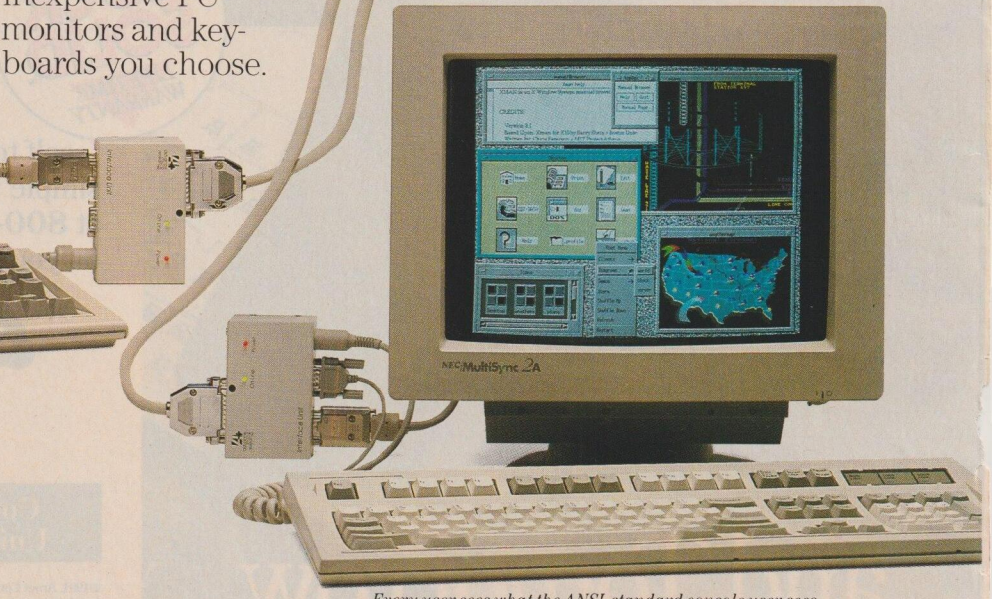


OUTPERFORMS THE COMPETITION—OURS AND YOURS.

Your UnTerminal-based MultiConsole solution will outperform any other multi-user solution.



UnTerminal stations make every user a MultiConsole user.



Every user sees what the ANSI-standard console user sees.

PC MAGAZINE EDITORS' CHOICE August 1990
AMR Video Graphics Network Adapter

USER STATIONS STARTING AT $399

multiuser systems shine.

MultiConsole solutions make multiuser applications more attractive.

With faster screen refresh—graphics or text.

Instant switching between as many as 12 different multiscreens for simultaneously running multiuser applications.

And, in addition, giving users the power to run any popular DOS-based personal computer program.

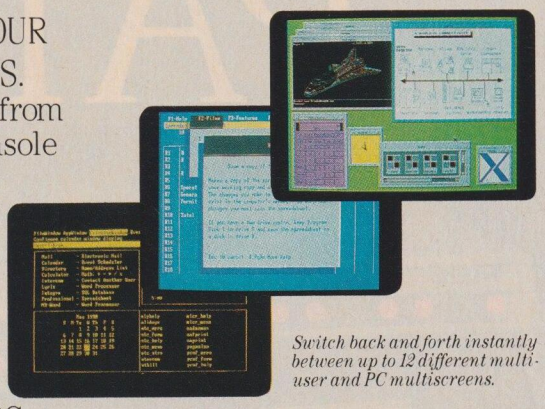
So MultiConsole solutions look as good on your P&L statement as they do in your sales demonstration.

Because while our MultiConsole capabilities make your solution more attractive, the surprisingly low cost makes your profit margin wider.

EASILY RETROFITS YOUR EXISTING SOLUTIONS.

Our driver emanates from the operating system console driver. So if your application runs on the system console, it automatically runs on every station—whether you're running under UNIX,® XENIX® or Multiuser DOS.

UnTerminal stations instantly enhance the power and attractiveness of any 386™- or 486™- based multiuser solution.



Switch back and forth instantly between up to 12 different multiuser and PC multiscreens.

WORTH MORE... COSTS LESS.

Just give each user an inexpensive PC monitor and keyboard. Connect it to the UnTerminal Multi-station Adapter of your choice. One of our EGNA,™ VGNA,™ VNA Plus™ or UnTerminal 8514® adapters is right for you. If the customer has an XT or AT, use our UnTerminal Connect Card to bring that online, too.

And for less than the cost of dumb terminals, you've got the smartest multiuser solution ever.

For more information or a complete demonstration, give us a call today at Advance Micro Research. 408-456-9400.

advance micro research inc

More for less: low cost monitors and keyboards are all you need.

The UnTerminal

MULTICONSOLE SOLUTIONS WITHOUT TERMINALS.

SCO UNIX, SCO ODT 1.1 & INTERACTIVE UNIX DRIVERS AVAILABLE.

Advance Micro Research, Inc., 2045 Corporate Court, San Jose, CA 95131. Phone: 408-456-9400. Fax: 408-456-9430.

UnTerminal, MultiConsole, Multi-station Adapter, EGNA, VGNA, and VNA Plus are trademarks of Advance Micro Research, Inc. UNIX is a registered trademark of AT&T. 8514 is a registered trademark of IBM Corporation. 386 and 486 are trademarks of Intel Corp. XENIX is a registered trademark of Microsoft Corp.

CIRCLE NO. 49 ON INQUIRY CARD

TEST PATTERN.

When Multi-Tech modems are put to the test, a pattern emerges.

In the 1980's, the dial-up market was dominated by 2400 bps MNP-5® modems. Today, it's 9600 bps modems with V.32/V.42bis. Following that same timetable, PC Magazine awarded our MultiModem224E its EDITORS' CHOICE in May of 1987. In December of 1990, they gave the nod to our MultiModemV32.

Here's what they had to say:

> "The MultiModemV32 can be configured for almost any application; it works under severely impaired lines, and it wins first prize for fast data transfers."

PC Magazine, 12/11/90 (Ziff-Davis Publishing) "9600-BPS MODEMS: Breaking the Speed Barrier-PC LAN Labs tests seven rapid-fire modems complying with V.32, V.42 and V.42bis standards."

If you're interested in performance, we're interested in you! To put us to the test, please call **1-800-328-9717.**

CIRCLE NO. 171 ON INQUIRY CARD

MultiTech® Systems

The right answer every time

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112 U.S.A.
(612) 785-3500 (800) 328-9717
U.S. FAX (612) 785-9874
International Telex 4998372 MLTTC
International FAX (612) 331-3180

Should Your Printer Be a Network Sprinter?

The joys of a networked printer with multiple users have special considerations

By Howard Baldwin

Although Dr. Alan Friedman admits he was careless, the problem he encountered could have happened to anyone with a printer that serves multiple networks. Friedman is senior systems specialist at pharmaceutical manufacturer Amgen. The network he administers encompasses Sun workstations, Macintosh computers, and Ethernet-based printers that serve both. It seems that one of the printers kept "disappearing" from the Ethernet network. No one could send print jobs to it.

Friedman initially suspected that a newly installed Macintosh was the culprit. Six frustrating weeks later, he realized what had gone wrong. He had installed a gateway for the Macintosh network whose internet protocol (IP) address was only 15 numbers below that of the printer. "As soon as the 16th Macintosh logged on the network and used the gateway, it overwrote the IP address for the printer," he recalls. He gave the printer host address number one, and solved the problem.

Friedman's challenge is only one of many to consider when purchasing a printer to serve heterogeneous networks. Networked printers are settling into a new niche that combines the dimensions of individual desktop devices and the practicality of shared office copiers. A networked printer, by definition, attaches to the Ethernet by itself, without benefit of a dedicated computer.

Although it will need a host for booting, a network printer can act as a node on the network unto itself, even accepting print jobs from multiple networks. Because of its independence and double

FRED STIMSON / printer courtesy TALARIS SYSTEMS INC.

duty, the purchase decisions that go into a network printer are somewhat different than those that go into the purchase of a desktop printer.

A Little of This, a Little of That

Perhaps the biggest advantage of a network printer is its flexibility. They can be used not only to serve multiple users, but to serve multiple networks. At Texas Instruments' research and development center, a Talaris Systems printer handles output from 120 users accessing 10 Sun workstations, seven Digital Equipment Corp. VAXes running Ultrix, and three VAXes running VMS, according to Susan Hric, a member of the technical staff.

You'll also need to consider the different emulations and fonts networked printers use–how they handle the graphics languages that images are "written" in. At TI's R&D center, users need not only PostScript emulation, but emulation for HPGL (Hewlett-Packard graphics language), and Quick, a proprietary emulation that appeared on earlier Talaris printers. "Font emulation was important because we had spent a lot of money on Talaris' soft fonts, which we could download onto the [printer's] hard drive," says Hric.

Confirming flexibility of the printer across the network requires diligence and vigilance at the buying stage. Employees at the computing services center at the University of California at Davis also access a Talaris printer with three different operating systems, according to programmer/analyst Kathy Hemnes. Besides a VAX 8600 running VMS, she administers three VAXes and a Sun network consisting of 30 workstations and three Sun servers.

Hemnes is generally pleased with the Talaris printer because of its ability to work across networks. The Sun network, she notes, also has two Apple LaserWriter printers which can be accessed by the VAX running Ultrix, but not by the VAX running VMS. Nevertheless, she warns that the Talaris software "behaves differently between the SunOS and Ultrix. I had to write a special script for Ultrix, because the Ultrix `ltr` command would literally eat the font and margin specifications and never get them to the printer."

"UNIX is not universal," stresses Hemnes. She recommends that "if [the manufacturer] says it's UNIX-compatible, remember there are differences within each UNIX where it might not work." Her advice: test the printer to make sure you get output from files on each individual host on the network.

Mike Murphy, a member of the technical staff at GTE Laboratories echoes Hemnes' advice. Of the 700 staff members, about half use Macintoshes. The rest use DECstations or access a VAX 6410 running Ultrix, with output going to 70 Apple LaserWriters and seven QMS PostScript printers. "Make sure the host software you get for the printers is going to work on every kind of host you've got," says Murphy. "It's hard to add that capability in later."

Be sure you can get output from each host on the network

Both GTE's Murphy and UC Davis' Hemnes point out one significant drawback of network printers: the inability to keep track of output for auditing purposes. Each would like to track who's using how much of the printing supplies so the costs can be charged back to them. "We're supposed to charge people for usage, but the Talaris didn't come with software for counting sheets used and printed," laments Hemnes. "There isn't even a manual counter."

The situation is almost the same with GTE's QMS printers. "You can get [counting] as an option," says Murphy, "but the printer will refuse to accept new jobs until it's completed a transaction with a machine [requiring auditing]."

Testing, Testing

There are really two levels to the testing process. Once you've tested the printer to make sure it works with your hosts, you should test it to ensure it works with your files by testing as many different kinds as possible. Murphy compiled almost two dozen sample files from people throughout GTE that encompassed several varieties of text and graphics.

Mike Sivadon, a systems analyst in the design automation management group at Amdahl, had specific testing requirements. His colleagues had both SPARCstations and HP workstations outputting to Sun, HP, and Apple printers. Sending a PostScript file from an HP workstation to the HP printer worked satisfactorily, but printing ASCII text was a problem. "You might say the printer just threw up all over the place," he says.

Adobe Systems offers software called Transcript, which converts non-PostScript files to PostScript-compatible files. Sivadon used it on the Sun Laserwriter printers, but generally they were too slow, he says. Ultimately, he brought in a faster BGL Technology printer–and some BGL Technology technicians–and had them write a filter akin to the Adobe Transcript program. To test it, he sent FrameMaker files from the HP workstation and the SPARCstation to the BGL printer, as well as an ASCII file. Once he was confident that all the hardware and software could work together, Sivadon was satisfied.

Speed Demons

What happens to speed when the printer is on a network, being accessed by multiple users? It's frustrating to have a one-page memo stuck in a print queue behind a 100-page sales report or a PostScript document that takes several minutes to print. To obtain the best speed, people recommend buying a printer with at least

Selected Printer and Plotter Vendors

BGL Technology 451 Constitution Ave., Camarillo, CA 93012; 805-987-7305

Da Vinci Graphics 870 Hermosa Dr., Sunnyvale, CA 94086; 408-737-8800

Digital Equipment Corp. 444 Whitney St., MS NRO2-1/S3, Northboro, MA 01532; 508-351-4401

QMS P.O. Box 81250, Mobile, AL 36689; 205-633-4300

RasterGraphics 285 N. Wolfe Rd., Sunnyvale, CA 94086; 408-738-7804

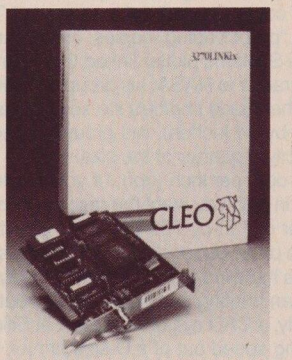
Sun Microsystems 2550 Garcia Ave., Mountain View, CA 94043; 415-960-1300

Talaris Systems P.O. Box 261580, San Diego, CA 92196; 619-587-0787

This list contains contact information only for those vendors mentioned in this article and is not intended to represent all vendors in this market.

I • N • T • R • O • D • U • C • I • N • G

3270 Coax for UNIX



CLEO's 3270LINKix™ provides complete, cost-effective mainframe connectivity for your UNIX systems.

You just plug in a coax board (our own or any IBM advanced coax adapter or compatible), load the software, and

Application Program Interface

link to your mainframe through a remote or channel-attached IBM 3174/3274 controller.

With 3270-LINKix, you get full emulation of IBM 3278 monochrome display terminals (models 2-5) and 3279 color terminals (models 2A, 2B, 3A, and 3B), in CUT or DFT mode.

You also get full IBM 3287 printer emulation (LU Types 1 and 3) for your UNIX-attached ASCII printers.

UNIX systems supported include SCO's UNIX System V 3.2, AT&T's UNIX System V/386, Interactive Systems' 386/ix, and others. Features include:

- Application Program Interface (HLLAPI 3.0)
- IND$FILE file transfer for CMS, TSO, and CICS
- Up to five sessions, with support for SNA or channel-attached non-SNA communications, in DFT
- User-configurable keyboard mapping
- Easy menu-driven interface

5 sessions, for SNA or channel-attached non-SNA, in DFT

To learn more, call us today at **1-800-233-2536**. Or write to us at 3796 Plaza Drive, Ann Arbor, Michigan 48108. FAX: 313/662-1965.

CLEO®
CLEO Communications
A Division of Interface Systems, Inc.

AVAILABLE WORLDWIDE!
In Europe call Sintec Peripherals Ltd. in Slough, England, at 0753-811888 (FAX: 0753-811666).

Check the Oil and Water Frequently

If you need a printer that outputs paper quickly, Amdahl systems analyst Mike Sivadon recommends looking at a printer's paper loading accessories. His printer features two hoppers, each large enough to hold 500 pages. "If someone has to load paper [into the printer] all the time, you almost have to pay an operator," he cautions. Given that technology is supposed to decrease a company's overhead, not increase it, hiring someone to oversee a printer is not usually something you can afford.

But you can buy a service contract and ease-of-maintenance contract. The sheer number of working parts in a printer make it prone to breakdowns, especially when it's under the stress of constant access by multiple users. Sivadon explains, "You could have a printer come in and work wonders for you, but it could break down all the time." He recommends a service contract that spells out how quickly, in hours, a service technician will respond.

Dr. Alan Friedman, system administrator at Amgen, concurs. "The only time we had a problem with the printer was when we ignored proper maintenance." Since he purchased a service contract, the only time he sees service technicians is when they come to do scheduled preventive maintenance.

Not every problem needs a service technician. Evaluate how simple the manufacturer has made troubleshooting. Sivadon compares the BGL printers at Amdahl to "new-age copy machines that walk you through" to the trouble spot. Anyone can generally figure out how to fix paper jams or other problems. —*H.B.*

The Plotter Thickens

Unlike printers, plotters have yet to achieve network status. They're still attached to single workstations, but they have appropriated several printer characteristics that you may find useful to evaluate when making a purchase decision.

In addition to the traditional means of plotting an image by pen, you can now get penless plotters that follow the laser-style of printing. Pen plotters make several passes depending on the line thickness required, so that while they're more exacting, they're also slower.

Some engineering groups have responded by purchasing a faster plotter for what are known as "checkprints" as opposed to final copies, called "release prints." The checkprints are schematics that can be used as "proofreading" copies. John Martin, a product designer at Lockheed, uses a Da Vinci Systems plotter linked to a PC running XENIX to print such copies quickly. As a contractor to NASA, his group is working on designing the hardware that will be used in the space shuttle's life science laboratory. Instead of printing out "D-size" plots (22-by-34 inches), the group produces plots at "B-size" (11-by-17 inches), which is exactly a quarter of the size.

Martin suggests evaluating the resolution, or dots per inch (dpi). "If you're taking [detailed] drawings in D-size and shrinking them in half, you want the resolution to be very high." The resolution of his Da Vinci plotter is 720-by-720-dpi, the highest he could find. He adds that because the plotter uses photocopier paper rather than special electrostatic paper like some plotters, it makes handling and storage much easier.

Printing on B-size sheets is certainly faster than printing on D-size sheets, but it's not the only way to achieve speed. Dave McEvilly, a CAD systems analyst at Silicon Graphics, suggests another way to look at getting speed out of a D-size printer. His group uses a RasterGraphics ColorStation plotter attached to an SGI workstation. "Our main plotting [need relates to] line thickness and weight. We needed black-and-white; color is an added benefit," he explains, adding that to make the plotter go faster, "we just put it in black-and-white mode–it skips all the color modes and goes."

McEvilly also suggests that the kind of workstation you link to the plotter affects your buying decision. Using his company's own high-end workstation enabled him to buy a lower-priced plotter. "It doesn't have a lot of bells and whistles, like RIP [raster image processing]." Because the processing to translate the images from vectors to rasters is done inside the workstation, the plotter doesn't need that processing power. On the other hand, he advises, "Someone who doesn't have a powerful workstation might want a more powerful plotter." —*H.B.*

two megabytes of RAM and 40 megabytes of storage, but to also be cognizant of how easy, or difficult, it is to upgrade the printer. TI's Hric has already upgraded the RAM in the group's Talaris Systems printer twice, first from one megabyte of RAM to two, and then from two to four. Talaris sent the chips and the instructions on how to replace it and the process only took about 30 minutes, Hric says.

Generally, high-speed printers can output pages at a rate of 24 to 26 pages per minute (ppm). That's about three times as fast as most general-purpose laser printers, which output at about 8 ppm. A PostScript image will slow down a printer, but if a user requests 26 copies of the same image, once it has been composed in the printer, it will print out at 26 ppm.

Brad Krebs is a programmer at the University of California at Berkeley's Electronics Research Lab, where four professors and 70 graduate students in the computer science and electrical engineering departments share the lab's two DEC Printservers. The printers spit out everything from the text of conference papers to graphics of integrated circuit designs. Krebs didn't take DEC's data sheet claims of performance at face value; instead, he timed the output with a stopwatch. While text output matched the specifications, he found that when the printout was more complicated, output "slows down quite a bit."

There are other methods of timing, of course. Amgen's Friedman suggests that if you're using Adobe PostScript, initiate the program called `timepage.ps`. It calculates how much processing time it took to convert PostScript code into an image, and then stamps the answer on the first page of the document.

On-site, Online

For the best results, all testing should be conducted in real-world conditions. Have the vendor wheel in a network printer for you to test over a week or so and schedule time for at least one of the vendor's technicians to visit the site with the sales representative to tweak any problems into submission. Amdahl's Sivadon, who stood over BGL Technology's staff while they worked on filters for his system, insists that you should "bring [the manufacturer's technicians] in and have them take care of it."

Have your sample test files ready to go, incorporating everything from ASCII to PostScript and from text to graphics, to confirm to your satisfaction that everything you can input, the network printer can output. The whole idea of inputting data into a computer, after all, depends on your being able to get it out again later. ■

software for UNIX

GREAT SOFTWARE FROM UNIPRESS

INCLUDING NEW X PROGRAMS

DOS-UNIX-MAC CONNECTIVITY

XVision™—for MS Windows™ X

Add X Windows to your PC. New version of the bestselling DOS™ Windows X server, with up to 256 colors! Less expensive and better than an X terminal—run X and DOS applications simultaneously. Price **$449**

PC-Connect™—for MS Windows

Run local PC and remote UNIX® applications simultaneously by clicking on MS Windows icons. Cut-and-paste, Dynamic Data Exchange (DDE) and optional SQL database link between systems. Uses either serial or Ethernet. Priced from **$1,140**

PC-Xview™ X

Turn your PC into an X Windows terminal! DOS-UNIX hot key. Priced from **$445**

eXodus™ X

X Windows server for Macs™. Supports MultiFinder. Works with AppleTalk, TCP/IP, DECnet. Price **$295**

PC/TCP™

Ethernet software for DOS-UNIX networking. Supports *ftp, telnet, rlogin,* etc. Ideal for XVision, PC-Connect, PC-Xview. NFS option allows DOS disk to reside on UNIX host. Priced from **$400**

BUSINESS

FrameMaker™ Desktop Publishing X

Premier UNIX desktop publishing software. Powerful, yet easy to learn and easy to use. Price **$2,500**

eXclaim!™ Spreadsheet X

High performance X Windows spreadsheet with mouse, pull-down menus, dialog boxes, scroll bars. Accepts 1-2-3™ files, functions, macros. Customizable graphics. Live Link to FrameMaker. Realtime version available for financial and process control applications. Priced from **$695**

Q-Calc Standard Spreadsheet

Award-winning spreadsheet for CRTs. Accepts 1-2-3 files, functions, macros. Graphics option. Economical multi-user licenses. Priced from **$750**

MasterPlan™ Project Management

Powerful project management system. *Sun Observer* "1990 Best Product" winner. Priced from **$750**

Uniplex™ Office Automation

Comprehensive UNIX office software with word processor, spreadsheet, database. X Windows option. Priced from **$1,225**

X WINDOWS DEVELOPMENT

UniPress Emacs™ Editor Family X

State-of-the-art customizable programmer's editors for UNIX, DOS, VMS™. Full X Windows support. Enhanced language-sensitive C-macs™, C++macs™, AdaEmacs™, FortranEmacs™. Priced from **$395**

X.desktop 3.0™ X

New version! Easy-to-use Mac-style desktop for your X Windows computer. Just click on icons to organize directories, select files, and run UNIX programs. Unparalleled configurability. Price **$795**

Motif for Suns X

Motif Window Manager and Motif Development Kit—now available for Sun workstations! Price **$595**

XView™ Toolkit for IBM®, DEC™, HP™ X

Developers— Move your Sun XView and SunView™, programs to all major UNIX workstations — without recoding! Price **$2,495**

X.deskterm™ Toolkit X

UNIXWORLD 1990 'Best Product'. Quickly convert your character-based UNIX applications to X Windows. Requires no X programming. Priced from **$3,000**

ExoCODE™ Screen Builder X

Fast WYSIWYG interface design. Generates native C code automatically. Versions for Motif, XView. Price **$1,500**

HARDWARE SPECIALS

Sony Laptop UNIX Portable X

Carry this sleek new 17 mips 17 lb. UNIX RISC™ workstation anywhere —sales demos, trade shows, seminars, home, office. Hi-Res X Windows display. Built-in Ethernet. Stereo. Price **$9,900**

VSI*FAX

Stop waiting in line! Fax directly from your workstation or terminal. Accepts PostScript or text documents. Includes all needed hardware and software. Priced from **$1,695**

UNiMARKET

UNIPRESS SOFTWARE

2025 Lincoln Highway, Edison, NJ 08817 Fax 908-287-4929
Dealer Hotline • 908-287-8661

800-222-0550 • 908-287-2100

All product names are trademarks and registered trademarks of their respective companies.

Sun's Upscale *SPARC 2*

Photo courtesy SUN MICROSYSTEMS, INC.

Sun has redesigned the SPARCstation 2 with faster performance and a better operating system, but it doesn't come cheap

Thanks to the SPARCstation 2, millions of Sun worshippers can remain loyal to Sun Microsystems. The $15,000 SPARCstation 2 doesn't break performance records, but is fast enough to tread water with the IBM RS/6000 Model 320 and Digital Equipment Corp.'s DECstation 5000/200. And it is good enough, thank you, for Sun users who are already committed to SPARC-based applications and the SunView and OpenWindows graphical user interface (GUI). But exceptionally fast, like the $12,000 Hewlett-Packard Apollo Model 720, it is not.

Sun holds a unique position in the RISC wars. Many people are committed to Sun, its applications, and its GUIs. These users, especially software application developers, find Sun platforms appealing because of software support and hardware performance. The original SPARCstation was Sun's bailiwick until IBM released its RS/6000 line in March 1990. Now, power-hungry Sun users can lust after some third-party products that boost the SPARCstation 2 into the minisupercomputer realm.

The SPARCstation 2 addresses the competitive weaknesses of earlier SPARC systems. By doubling overall performance compared to the SPARCstation 1, and improving floating-point and graphics performance, the SPARCstation 2 is a solid machine. It has a 21.2 SPECmark rating, with 4.2 double-precision Linpack megaflops, and a full line of 2-D and 3-D graphics accelerators. Just as important, Sun has listened to its users and responded with enhancements to its hardware, SunOS (more than 500 bug fixes), and OpenWindows, the Sun implementation of Open Look. The sum of these changes makes the SPARCstation 2 a formidable competitor.

As of today, Sun continues to lead the workstation market with an estimated 29 percent share. Close behind is HP Apollo with 23 percent, Digital Equipment Corp.

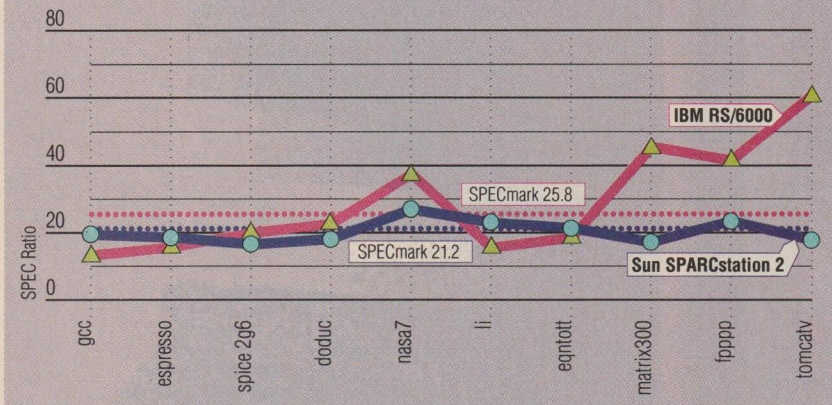
by Cimarron Boozer

with 18 percent, and IBM with four percent, according to International Data Corp. Before the SPARCstation 2 arrived, IBM's RS/6000 Model 320 and the DECstation 5000/200 exploited the weaker SPARCstation 1+. IBM and DEC successfully beat up the SPARCstation 1+ with better SPEC ratings, two to three times better floating-point performance, and superior graphics. Even so, all of the above workstations pale when compared to the HP Apollo Model 720, with its SPEC rating of 72.

Added color support for the SPARCstation 2 gives Sun excellent position in the area of electronic publishing, offering color pre-press and graphic design. Enhanced graphics also appeal to developers who must create code for advanced color systems. All developers will be pleased with faster compile times, better process concurrence, and an improved make facility.

SPARCstation Performs Well on SPEC

The SPARCstation 2 excels as a general-purpose workstation. The SPECmark shows that the integer tests (gcc, espresso, li, eqntott) surpass the IBM RS/6000 Model 320. On the other hand, the RS/6000 outperforms the SPARCstation 2 on the tight-loop, floating-point-intensive tests such as fpppp and tomcatv benchmarks.



The SPARCstation 2 tested had 16 megabytes of memory, 64 kilobytes of instruction/data cache, with a 40-MHz SPARC processor and a 40-MHz floating-point processor, running under SunOS 4.1.1. The IBM RS/6000 Model 320 had a 20-MHz POWER processor and an integrated floating-point unit, with 32 megabytes of memory, a 32-kilobyte data cache, and an 8-kilobyte instruction cache, running under AIX 3.

Is the Price Right?

I evaluated a basic SPARCstation 2GX with 16 megabytes of main memory, a 207-megabyte internal SCSI disk, and a 3 1/2-inch internal floppy drive. With the 19-inch Sony color monitor, the list price for this configuration is $19,995 ($2,000 less for the smaller 16-inch monitor). In addition, the system included an external 669-megabyte SCSI disk (its space was definitely needed) with an integrated 150-megabyte 1/4-inch tape drive for $6,500. The total damage was $26,495.

This price is lower than a similarly configured IBM RS/6000 Model 320, DECstation 5000/200, or HP Apollo 720. The midrange 3-D system, the SPARCstation GS, with the $6,500 external disk lists for $33,495. Sun's high-end SPARCstation 2GT, with a 21-inch monitor and external disk costs $56,495. Our review focuses on the SPARCstation 2GX, although overall system performance, outside of graphics, on any of the SPARCstation 2 models is identical.

The system I received came in four boxes: The SPARCstation 2 itself, the 19-inch color monitor, the external disk drive, and the documentation. I had the system set up and running in 10 minutes. Because Sun pre-configures the disk and operating system with the user account **`openwin`** ready to go, I could use the system and run demos and tutorials immediately. Installing the enhanced version of C, Fortran, and other unbundled products meant running **`extract_unbundled`** and answering a few questions.

One problem with the SPARCstation 2 and its associated software is a lack of disk space. What else is new? On the review system's 207-megabyte internal disk, I was left with about 150 megabytes after accounting for the root and swap partition. After installing OpenWindows, compilers, applications, and demos, I had a mere six megabytes of open disk space left. If you omit some of the software or reduce the size of the swap partition, you could possibly run on the single internal disk, but not comfortably. Most users, I suspect, will need an additional 207-megabyte internal disk or a 669-megabyte external disk.

Looks Familiar, Feels Different

The SPARCstation 2 enclosure is identical in size, shape, and color to its predecessors, the SPARCstation 1 and 1+. The keyboard is the standard Sun-4 model, with both L1-L10 and F1-F10 function keys. The three-button optical mouse from Mouse Systems uses a normal optical pad.

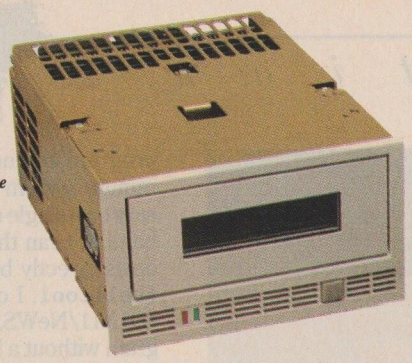
The entry-level SPARCstation 2 is configured with a crisp 19-inch monochrome monitor with a 76-Hz refresh rate. If you want color, you pay another $3,000. Unlike the SPARCstation 1+'s standard color option, the SPARCstation 2 has a GX module with frame buffer. Both 2-D and 3-D GX boards have a dual-slot SBus, giving you one free slot for other peripherals.

Sun claims that the GX option generates up to 450,000 2-D vectors per second, or 240,000 3-D vectors per second. When drawing short vectors of less than 10 pixels long in 2-D mode, performance is about three times better than that of the competing DECstation 5000/200CX and the IBM POWERstation 320 with standard color.

The SPARCstation 2's resolution on both the monochrome and color monitors is 1152-by-900 pixels. This is 21 percent lower resolution than the 1280-by-1024 pixels offered by DEC, IBM, and HP. This difference in crispness is hardly noticeable in a software development environment using spreadsheet or document processing programs. The lower resolution can make a difference in very high resolution CAD/CAM applications, however.

Sun Windowing

OpenWindows is Sun's bundling of the Open Look GUI, DeskSet desktop productivity tools, X11/NeWS server, and the XView and NeWS toolkits. OpenWindows 2.0, included with



The EXB-8200
8mm Cartridge Tape Subsystem
2.5 Gigabyte Capacity
246 Kbytes/Second Transfer Rate

The EXB-8500
8mm Cartridge Tape Subsystem
5.0 Gigabyte Capacity
500 Kbytes/Second Transfer Rate

Mass storage with mass appeal.

1991 digital review TARGET AWARDS WINNER

LAN MAGAZINE 1991 PRODUCTS OF THE YEAR

SYSTEMS INTEGRATION Product of the Year AWARDS Finalist

THE SUN OBSERVER 1990 Excellence Awards WINNER

EXABYTE revolutionized the tape storage industry in 1987 by introducing the first 8mm cartridge tape subsystem. Since then, the high capacity and low cost of 8mm digital recording has made it the technology of choice for mass storage.

Over **180,000 EXB-8200 8mm Cartridge Tape Subsystems** have been installed in more than 85 system environments. With 2.5 gigabytes of uncompressed data capacity and optional high-speed search functionality, it's no wonder the EXB-8200 has become the *de facto* data storage standard in workstation, midrange system, and file server environments.

Now, EXABYTE's next generation of 8mm technology advances beyond the performance and capacity of the EXB-8200. The **EXB-8500 8mm Cartridge Tape Subsystem** provides over 5 gigabytes of uncompressed storage capacity on a single 8mm tape while achieving an extraordinary data transfer rate of 500 Kbytes/second. In addition, high-speed search at 37.5 Mbytes/second allows for rapid file retrieval. It's designed to meet the growing demands of today's supermini and mainframe computer systems.

So if you're searching for the solution to today's data intensive storage requirements, call the regional office nearest you or write EXABYTE Corporation at 1685 38th Street, Boulder, CO 80301.

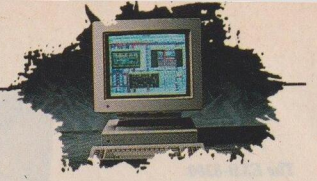
And find out why 8mm digital recording technology is mass storage with mass appeal.

Eastern U.S. (407) 352-5622, Ext. 82
Central U.S. and Canada (708) 953-8665
Western U.S. (714) 582-5211, Ext. 4
Europe (Amsterdam) 31-3403-51347

CIRCLE NO. 62 ON INQUIRY CARD

EXABYTE® The Capacity to Succeed

©1991 EXABYTE Corporation



Boosting SPARCstation 2 Performance

Several vendors offer performance enhancement products for the Sun workstation line. Typically, these products take existing user source code and accelerate numerically intensive code, remaining compatible with SunOS. These products target applications that require exceptional floating-point performance: signal and image processing, simulation, computational chemistry, and scientific research.

SKY Computers (Chelmsford, Mass.) offers the SKYstation, a so-called "desktop supercomputer" that works in conjunction with the SPARCstation family. The SKYstation, sells for $9,950, is based on Intel's i860 and i960 RISC technology, and fits on top of a SPARCstation "pizza box." The SKYstation provides up to 80 megaflops of peak computational capacity using its own memory architecture: 160-megabyte per second bandwidth bus addressing up to 256 megabytes of memory inside its box. The SKYstation connects to a SPARCstation 2 via the high-speed SCSI-2 port, can sustain four megabytes per second in synchronous mode, and provides tools and vectorizing C and Fortran compilers that look and feel like Sun's. The SKYstation also works with Sun-3 and -4 systems.

Star Technologies (Sterling, Va.) sells the Star 910/VP, a high-performance Sun-compatible compute server for network computing environments. Unlike the SKYstation, the Star 910/VP won't fit on your desktop, but can be connected to the SPARCstation 2 to perform as a compute server. The Star 910/VP claims up to 160 megaflops of peak performance using four Texas Instruments 8847 arithmetic units. The Star 910/VP uses the same 40-MHz Cypress SPARC chip found in the SPARCstation 2 and reproduces Sun's VME-based I/O system, albeit with higher bandwidth.

The Star 910/VP uses a novel approach to higher performance: an extension of the SPARC instruction set is used to implement its vector operations, generated with their own vectorizing compilers. It is priced starting at $215,950.

FPS Computing (Beaverton, Ore.) offers the Model 500EA "UNIX Supercomputer," a rather complex design combining scalar, vector, and parallel processing architectures into a single computer system. The core technology is emitter coupled logic (ECL) SPARC, an 80-MHz implementation of Sun's SPARC architecture. FPS uses the Intel i860 for its matrix coprocessor units and its own proprietary design for vector processing. The Model 500EA claims a peak 64-bit performance of 1.1 billion floating-point operations per second. The Model 500EA is priced from $820,000 to $4 million, and is reported to be available in the second quarter of 1991. —*C.B.*

the SPARCstation 2, is an ambitious attempt to woo users and developers from the older SunView GUI. OpenWindows comes preinstalled, but you must install SunView if you want it.

Sun provides a tutorial on OpenWindows with the SPARCstation 2. Similar to the Macintosh tutorial, it provides an introduction to windowing concepts, use of the mouse, menus, and the DeskSet tools. The tutorial also includes animated demos. For example, the first demo displayed a series of menus and a disembodied mouse pointer ran through them.

One of the more difficult issues Sun faced was reconciling the older SunView window system under OpenWindows. For example, SunView users are used to pressing the middle mouse key to move and re-size windows, but with OpenWindows they must now use the first button. Moving into or out of a SunView window under OpenWindows causes the color mapping to switch abruptly, although this can sometimes be remedied with code modification or a special mapping of the color table.

A vexing problem within the window maze was the inability to run some older SunView programs from OpenWindows. For example, running programs in `/usr/demo/SUNVIEW` causes the entire screen to be taken over by the program and because the program can not be interrupted, a six-minute system re-boot becomes necessary on a single-user system. On the other hand, if I ran the original SunView windows directly by executing `/usr/bin/shelltool`, I could run both SunView and X11/NeWS, or any other type of program without a hitch.

Performance Improvements

My baseline for comparing the SPARCstation 2 was Sun's SPARCstation 1+. The 1+, a follow-on product to the original SPARCstation 1, has a 25-MHz clock, compared to the SPARCstation 2's 40-MHz clock. Another major improvement in the SPARCstation 2 is higher I/O throughput, achieved through re-design of the direct memory access system, I/O clustering, and increased SCSI buffer size. Other critical improvements were introduced in the SPARC integer unit and floating-point unit design. Sun's engineers also redesigned and reduced the number of application-specific integrated circuits from seven to six.

For the integer unit, Sun chose Cypress Semiconductor's CY7C601 SPARC chip, a 40-MHz CMOS processor. This chip is now available directly from Cypress for both SPARCstations and SPARCstation clones. To the Cypress product, Sun added a hardware cache *flush* for the SPARC registers, yielding a 30 to 40 percent increase in context switching time.

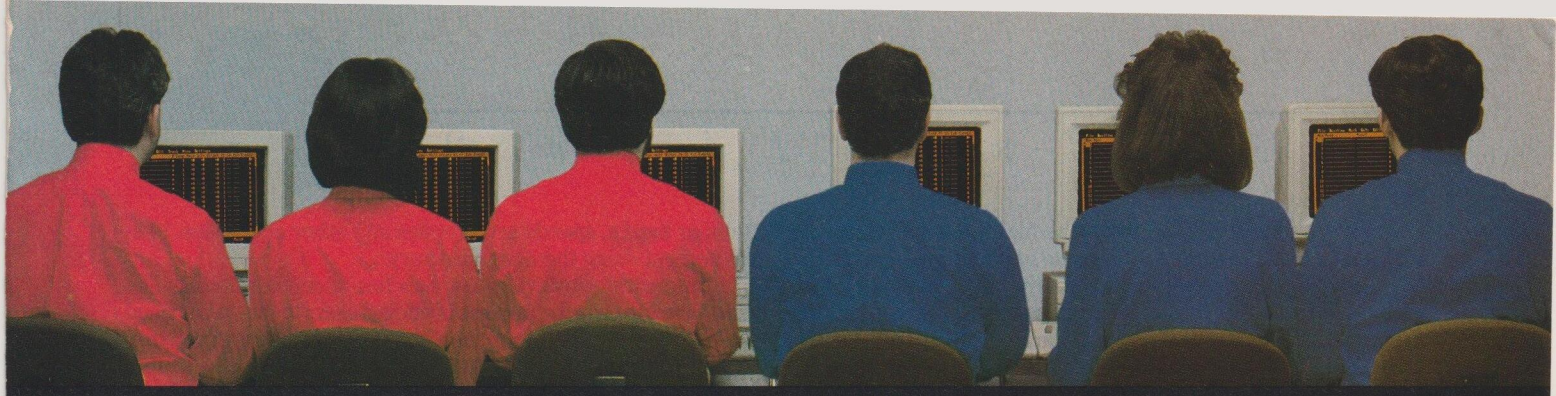
The SPARCstation 2 also has a 64-kilobyte data cache. Although Sun's SPARC has been criticized for its single bus implementation with processor chips that use a single 32-bit data bus, the 40-MHz clock rate and the use of external caches helps overcome the deficiency. The approach is less expensive for manufacturing.

The SPARCstation 2 more than doubles the raw floating-point performance over the previous SPARCstations. Sun uses the 40-MHz TI390C602A for its floating-point unit. To enhance floating-point performance, Sun complements the floating-point chip with two double-word write buffers and a double-word buffer on the RAM controller. These changes allow 80-nanosecond writes to memory (versus 200 on the older SPARCstation 1+), providing 64-bit transfers to memory. The end result is better floating-point performance and the memory bandwidth to support it.

Your Mileage May Vary

What type of improvement will you see on a typical numerically intensive application? Take a look at the SPECmark results for the SPARCstation 2. The SPARCstation 2 is about 90 percent better than the SPARCstation 1+ on floating-point dominant applications. On integer tasks, the SPARCstation 2 performs approximately 60 percent better. Because SPEC doesn't include significant I/O testing, it actually understates the improvements made in the SPARCstation 2. The applications I tested had both I/O and computational sections and ran an average of twice as fast on a SPARCstation 2 than on a 1+.

continued



Nothing connects UNIX and IBM better than Systems Strategies EXPRESS™

Quality UNIX-to-IBM connectivity is much more than a communications link. It's the flexibility to grow as your communications needs grow. It's the ability to make everyone more productive. It's the security of a proven product. It's Systems Strategies EXPRESS.

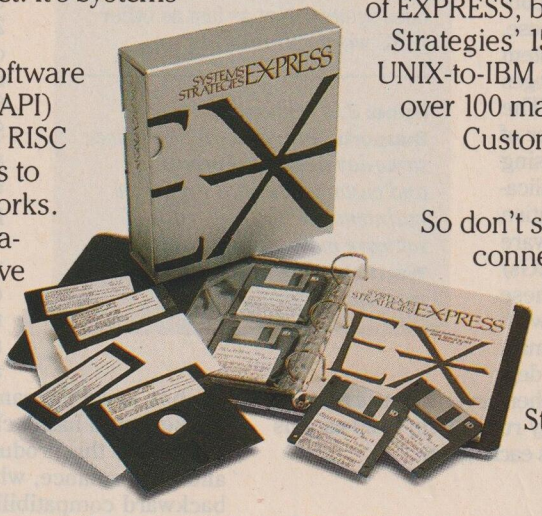
The EXPRESS communications software family (3270, RJE, LU6.2 and HLLAPI) connects your UNIX 386/486, IBM RISC System/6000 and PS/2 AIX systems to IBM SNA, QLLC/X.25 or BSC networks. And it also gives you important features to help you gain a competitive advantage.

EXPRESS supports up to 255 users – simultaneously, with speeds up to 64 Kb. And because it uses a dedicated communications board, the CPU is free to run local applications, improving performance and response time. The result: more people use the system more efficiently.

Plus, no one can match the field-tested quality of EXPRESS, because it's based on Systems Strategies' 15 years of expertise providing UNIX-to-IBM communications solutions to over 100 major computer manufacturers. Customers include Digital, Hewlett-Packard, IBM and Sun.

So don't settle for just any UNIX-to-IBM connection. Get one that improves everyone's performance – Systems Strategies EXPRESS. For more information, call Systems Strategies, a NYNEX company.

800-876-7671



Systems Strategies Inc.
225 West 34th Street, New York, NY 10001 212-279-8400 · Fax 212-967-8368

UNIX INTERNATIONAL MEMBER

NYNEX

IBM Business Partner

Systems Strategies EXPRESS is a trademark of Systems Strategies Inc.
All other names, products and services mentioned are the trademarks or registered trademarks of their respective vendors or organizations.

CIRCLE NO. 100 ON INQUIRY CARD

At present, the IBM RS/6000 is the highest profile competitor to Sun for computation-intensive applications. Since the SPEC floating-point applications perform primarily 64-bit arithmetic, IBM's RS/6000 Model 320 does especially well on the fpppp, nasa7, and tomcatv benchmarks. This speed results from IBM's 64-bit pipelined architecture and its ability to semi-vectorize certain codes. In IBM's Model 530 and 540, the performance of these three floating-point benchmarks accounts for most of the increase in SPEC performance.

On the SPARCstation 2, separate SCSI and Ethernet line buffers provide a 16-byte block for buffering I/O. This substantially increases the old 4-byte FIFO (first-in, first-out) found on the SPARCstation 1+, that often caused Ethernet versus SCSI contention which resulted in dropped packets. If you do heavy SCSI disk access while simultaneously accessing the Ethernet, this single change can improve SPARCstation 2's SCSI bandwidth and Ethernet performance dramatically. The SBus now allows increased burst rate transfers, from 16 to 64 bytes. I found that these changes improve network file system performance, especially with SCSI disks.

Related to the hardware improvements were changes to the SunOS 4.1.1 operating system. One of the major changes was improvement of Sun's UNIX File System (UFS). The goal was to increase I/O throughput while maintaining the on-disk file system format. With a single clustered I/O taking the an place of 15 to 30 block I/Os, Sun creates an increase over sequential performance by a factor of two. I found the SPARCstation 2 uses the two SCSI disks much more responsively when running multiple tasks, especially with heavy I/O. This change should improve performance in heavy I/O-bound environments, such as concurrent access to a central SQL database.

Sun has also beefed up overall system performance and made hardware changes to the memory management unit. The SPARCstation 2 doubles the number of contexts in hardware to 16, increasing performance for simultaneous applications, especially when the SPARCstation 2 is a server. The number of hardware Page-Mapped Entry Groups (PMEGs) was increased from 128 to 256. These hardware changes, in concert with SunOS now shadowing PMEGs in main memory, relieves the performance degradation that previously occurred when several concurrent applications were run. I verified this by running up to 20 various programs of four to eight megabytes each in size.

Changes for the Better

The SPARCstation 2 is a better Sun machine because of the many improvements to SunOS 4.1.1, system administration, and compilers. Sun claims that SunOS 4.1.1 was not a bug-fix release, but with more than 500 bug fixes, Sun has clearly improved operation. One improvement to the temporary file system, or **tmpfs**, speeds up compiles and other operations 10 to 15 percent using the **/tmp** directory.

In the administrative areas, Sun has added commands like **add_user** to ease the process of adding users to the system, and **showrev** to display information about the workstation and executable file revision levels. Another change I liked is the feature that lets you read MS-DOS diskettes in the 3 1/2-inch diskette drive. You can easily mount the disks with a **mount /pcfs** command and create, delete, read, and edit the files with UNIX commands. I was able to plug in an MS-DOS disk, copy a Lotus 1-2-3 spreadsheet file, and read the file directly into the Sun version of Lotus 1-2-3 on the SPARCstation 2. One feature I missed on the SPARCstation 2 was the ability to read Apple Macintosh diskettes.

Sun's new Sun C 1.1 and Fortran 1.4 compilers provide a major performance kick. Sun's compiler folks deserve accolades for their work. When I ran the SPEC benchmark suite using the standard SunOS C and Fortran 1.3.1, my SPECmark was 17.3, but with the new compilers, the SPECmark was 21.2, or about 20 percent better. This change can also be seen in the current SPARCstation SLC, IPC, and 1+ workstations. Using the new C compiler on the IPC or 1+ yielded 10 percent better SPEC performance, and with Fortran the improvement was about 25 percent. Sun has also incorporated additional levels of **-O** optimization into both C and Fortran.

Service and Support

Sun offers hardware support at hourly rates or by contract. The hourly rate is $110, with a two-hour minimum plus the cost of replacement parts. Contract service is available in four packages: same-day, next-day, customer-assisted, or on-site. For the reviewed SPARCstation 2GX without the external hard disk, contract prices range from $105 per month for the customer-assisted plan, $112 per month for next-day service, $140 per month for same-day service, and $91 for on-site service for up to 25 systems. Sun also offers software telephone support at $35 per month.

Overall, the SPARCstation 2 provides a much-needed boost for the desktop SPARCstation family. Sun has redesigned the guts of the system and made significant improvements to its architecture. Still, what does it mean if the box looks the same, the SBus slots work the same, and the keyboard hasn't changed? To me, it indicates Sun's commitment to this product line: providing the latest technology and performance, while maintaining a reasonable level of backward compatibility. If you don't need the ultimate hot box, like the HP Apollo Model 720, the SPARCstation 2 is worth your attention. ■

Cimarron Boozer is a product marketing manager with several years' experience in high performance computing and networking.

REVIEW HIGHLIGHTS

SPARCstation 2
Sun Microsystems
2550 Garcia Ave.
Mountain View, CA 94043
415-969-1300

+

A powerful workstation with excellent overall performance. Improved SunOS operating system. A large number of applications and outstanding tools and compilers.

−

OpenWindows environment sometimes clumsy. Needs additional disk to reasonably run a single-user system. Not as fast as other RISC workstations.

Price: *$14,995 and up.*
Support: *Through local Sun offices; same-day and next-day on-site and customer-assisted hardware maintenance. Varying levels of software maintenance available.*
Warranty: *90-day return to factory warranty.*

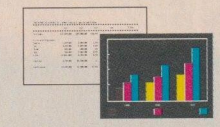
Get It Together

Lotus 1-2-3
WingZ

Compatibility is Key to Productivity

Unix's natural networking abilties make it an ideal OS for users who want to assemble documents from a variety of sources. *Getting the information together is where Island Write, Draw & Paint come in.*

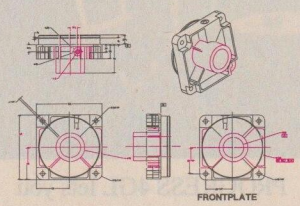
***Bring in images and text from** the popular spreadsheets, WP and tech pubs packages with IslandWrite. Then using Write's powerful layout functions, flow text around your image, or annotate it with Draw or Write.*



useful for your daily word processing needs as well as presentations and any other document. Create or import raster images with Paint and edit them. Then place them in your Write document.

If you use AutoCad or Cadam or any other program that outputs HPGL, CGM or PostScript, adding your image to an IslandWrite document is simple.

This sample document was created using IslandWrite. The text was typed in using Write's WYSIWYG word processing tools. The illustrations were added after the text, but with Write, you can easily add or delete illustrations at any time. The text will automatically reflow. Use IslandWrite, Draw & Paint to get your documents, presentations and reports together.



***Include CAD drawings in your presentations,** reports and documentation. If you have a change or annotation, do it using Draw or Paint without having to alter your original drawing.*

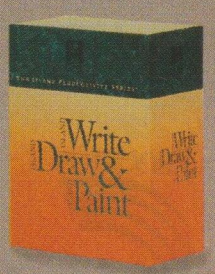
Of course, IslandWrite isn't only an assembler. It is a full-featured desktop publishing package

WordPerfect
Interleaf
Frame
MS Word

CGM
HPGL
PostScript
AutoCAD

TIFF
Sun Raster
MacPaint
X11

... with Island Write, Draw, & Paint, the award winning word processing, desktop publishing, and graphics solution for your UNIX workstations and X-terminals. Island includes import/export capabilities for most leading document, vector, and raster formats. Get your ideas together into persuasive, professional Island reports, memos, and presentations. And you can work on Sun, HP/Apollo, DEC, IBM, Sony, SGI, Sequent, and other platforms. All at $995 for a network license. So call Island Graphics at 1-800-255-4499 to pull it all together. Outside the U.S. 415-491-1000; In Europe +31-2503-24204



© 1991 Island Graphics Corporation. All trademarks are owned by their respective companies.

CIRCLE NO. 186 ON INQUIRY CARD

Welcome To The Wide Open Spaces Of Progress.

Welcome to a 4GL/RDBMS world that lets you decide how to build and run an unlimited range of applications without the usual limits. Without the usual constraints.

Take a seat and let us explain.

To begin with, the PROGRESS 4GL lets you build with incredible efficiency while giving you the control of a full-structured programming language.

When the name of the game is development speed, you've got it. When the name of the game is control, you've got it. When the project calls for both, you've got both.

And just to make sure you like the view, you've also got a menu-driven application builder, ANSI-standard SQL and 3GL access if you want it. You've got a true distributed RDBMS with client/server architecture and two-phase commit. You've got multi-threaded, scalable performance on large multi-processor systems.

But stay seated, there's more.

PROGRESS ties together data across different operating systems, networks and databases. It lets you port applications without modification across UNIX, VAX/VMS, OS/2, DOS (even 640k PCs) and CTOS/BTOS with AS/400 coming soon. PROGRESS applications run unchanged over distributed networks using TCP/IP, DECnet, NetBIOS and SPX/IPX. They even update Oracle, Rdb, RMS and PROGRESS databases simultaneously.

#1 In The Last Three Datapro User Surveys — 4GL RDBMS

What it all adds up to is 40,000 installations in 30 countries covering every conceivable application. Plus the #1 rating for efficiency, reliability, and overall user satisfaction in Datapro's last three surveys.

So find a phone and call **800 FAST 4GL** to find out about the PROGRESS Test Drive and the full Datapro report on PROGRESS.

Once you step into our world, you'll never want to leave.

Progress Software Corporation
5 Oak Park, Bedford, MA 01730
Telephone 617 275-4500
Fax 617 275-4595

PROGRESS

PROGRESS is a registered trademark of Progress Software Corporation.

Datapro, UNIX, VAX/VMS, OS/2, DOS, CTOS/BTOS, AS/400, TCP/IP, DECnet, NetBIOS, SPX/IPX, Oracle, Rdb, and RMS are registered trademarks of their respective manufacturers.

CIRCLE NO. 133 ON INQUIRY CARD

The Usual Limits Don't Apply.™

DESIGNING A FASTER, MORE EFFICIENT DATABASE

By Rick Farris

Database normalization is reduced to a rote process with Canonizer

Do you want to make your database perform faster? Canonizer from Six Sigma Case is a tool that removes database redundancies by reorganizing large database tables into smaller ones. If you are a database designer with little time to manually optimize database layouts, or if you oversee junior designers, Canonizer can ensure that your department has an efficient database.

The term for what Canonizer does is *normalization*. For small databases, such as ones used by an individual or small company, you can normalize the database manually by reorganizing the relationships between fields. Canonizer automates this process based on descriptions that you provide about the relationships. Additionally, Canonizer can read an existing database definition and convert it into "create" statements for different database languages.

Because Canonizer uses the industry standard **curses** interface, it runs on many operating systems, including most varieties of 386- and 68000-based UNIX, SunOS, Digital Equipment Corp. Ultrix, IBM AIX, Hewlett-Packard HP-UX, and DOS. And because Canonizer is used at the conceptual design stage, it works with any database management product. Six Sigma Case licenses Canonizer for network use, but it is basically a single-user product. Prices for Canonizer range from $795 for The Santa Cruz Operation UNIX version to $1,795 for high-end workstation versions.

I had mixed reactions to Canonizer. It does the job without flaw, but its interface is not perfect. Its top-level windows consist of a spreadsheet-like work area in the middle of the screen and a Lotus-like sliding bar menu at the top. The cursor keys change the current cell, and the space-bar cycles through the Lotus-style command menu. When you get deeper into the interface, however, command keys seem to change without consistency, and the smallest tasks sometimes become burdensome. Context-sensitive help is available from most screens, but no mouse support is provided.

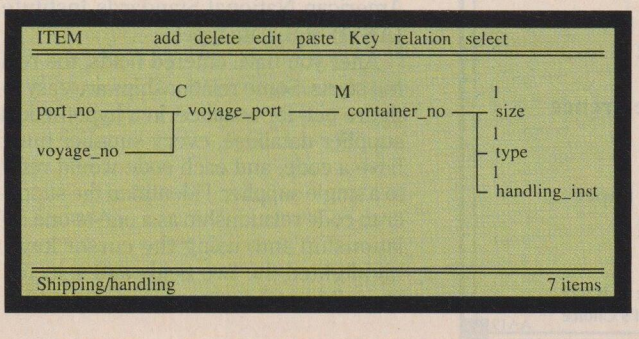
I tested Canonizer on a 25-MHz 386 running SCO UNIX. Six Sigma Case makes no bones about Canonizer's unfriendly installation procedure. Rather than use SCO's **custom** utility, I had to mount the installation floppy as a separate file system and perform a complex sequence of commands to copy the distribution. I would prefer an installation program that did not provide as many opportunities to make mistakes. Otherwise, Canonizer is easy on the system, requiring only 300 kilobytes or so of memory, and a little less than one megabyte of disk space.

Creating Database Connections

Imagine the kind of database you might use in a wholesale warehouse: It would track inventory and the names and addresses of customers and suppliers. In the inventory database would be a record of each part you stock with a reference to the supplier.

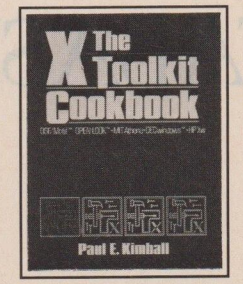
It would be wasteful to include the complete supplier name and address information for each part. Instead, you would include a supplier code. If you need supplier data, you can use the code to look up the complete information in the "supplier name and address" database. This process is called normalization. Because the database is smaller and better organized, searches are faster.

When I design a database, I start by listing groups of fields and drawing arrows between relationships. Database design with Canonizer is much the same: after entering some administrative data, you enter field names in the spreadsheet, and assign relationships. When designing by hand, I usually wear out a few erasers as I shuffle fields. In Canonizer, after you specify relation-



After data relationships have been specified, Canonizer produces tables with lines drawn between relevant fields to signify their relationships.

Do You Know Your Toolkit Options ?



X Toolkit Cookbook
Paul Kimball
1991, 800 pp., paper
0-13-973132-6

A must-have guide for anyone wishing to develop applications using the advanced Xtoolkit interface. Kimball leads you step-by-step through building complete windowing applications. The handbook delivers detailed sections covering each of the major industry toolkits including: OPEN LOOK, OSF/MOTIF, MIT Athena, DECwindows, and HP Xw.

Bestselling X Window and Motif References from Prentice Hall

Introduction To The X Window System
Oliver Jones
1989, 528 pp., paper
0-13-499997-5

The X Window System: Programming & Applications With XT (OSF/Motif ed.)
Doug Young
1990, 160 pp., paper
0-13-497074-8

OSF/Motif Reference Guide
Doug Young
1990, 160 pp., paper
0-13-624786-3

Prentice Hall
The Professional's Choice
AA19

CIRCLE NO. 94 ON INQUIRY CARD

REVIEW HIGHLIGHTS

Canonizer
Six Sigma Case, Inc.
P.O. Box 40316
Bellevue, WA 98004
800-827-4462, 206-643-6911

+

Step-by-step normalization procedure. Can read ANSI SQL. Many output formats.

−

Awkward user interface. A little expensive if you don't work with database structures daily.

Version: *1.5*
Systems: *SCO, Interactive, AT&T, Esix, SunOS, Ultrix, HP-UX, Motorola 68000-based UNIX systems, NCR, IBM RS/6000, and MS-DOS.*
Licensing: *Per CPU; networked option based on number of machines.*
Price: *$795 (386-UNIX) to $1,795 (High-end HP-UX)*
Support: *11 a.m. to 8 p.m. EST, toll-free number. Consulting services available. Yearly technical support agreement available at 15% of list price.*
Warranty: *30 day money-back guarantee. Unlimited warranty on media.*

ships, the push of a button produces a set of normalized tables.

Field data can be entered quickly and easily. Up-front data required by Canonizer includes the name of the field and the data type. The software also lets you specify whether the field can be blank, and whether each value must be unique. The available data types include all American National Standards Institute (ANSI) SQL data types.

After you have entered fields, the real fun starts. Some relationships are easy to figure out–for instance, in a hypothetical supplier database, every supplier must have a code, and each code would refer to a single supplier. I identified the supplier-to-code relationship as a one-to-one relationship and, using the cursor keys, highlighted the two fields and selected "1-one" from the menu. Canonizer added a line between the fields and labeled it with a "1" to show the relationship.

One-to-many and many-to-many relationships are harder to identify. As each relationship appears on the screen, Canonizer draws a line between relevant fields, with symbols and numbers to indicate the type of relationship. I liked the way that Canonizer let me move fields around on the screen. It resembles a scratch-pad approach and lets you untangle complicated intersecting relationships.

After describing relationships, Canonizer uses a technique called *canonical synthesis* to separate fields into normalized tables. Canonical synthesis is a rote methodology that is the equivalent of making lists of fields and is well suited to automation. Many designers will probably like Canonizer for this feature alone. With this approach, database creation statements can be generated in a number of different formats.

Swiss Army Knife

If you have an ANSI SQL description of an existing database, Canonizer can import the description and provide a variety of services. If the original database design is inefficient, Canonizer can normalize it as if you had created the description manually.

Output formats are Canonizer's strong suit. The review software came with filters to create ANSI-standard SQL, a data dictionary, C language header files, and various cross-reference views of the database. Other filters are available from Six Sigma Case, including those for dBase III and Pascal.

The SQL output filter emitted "CREATE DATABASE" and "CREATE TABLE" statements that were fully commented and ready to use with an SQL database manager. I've created SQL databases by interactively specifying format statements and making mistakes in the process.

Likewise, the dBase III and C language header filters can take a lot of work out of database revision for those who work in dBase or C. The data dictionary output is handy if you have a database product without a built-in data dictionary. The cross-references are also useful for documentation purposes.

Canonizer does a good job, but should be viewed as a handy tool–like a pocket calculator–and not as a panacea for database ills. It will help you work faster and more accurately, but it doesn't make you smarter. ■

Rick Farris is an independent software engineer. He can be reached on the Internet as `rfarris@rfengr.com`.

GSA PRICING NOW AVAILABLE

EMPRESS RDBMS, THE DIFFERENCE BETWEEN PROMISES AND DELIVERY.

The competition promises everything from binary data storage to X-Windows. There's a big difference between promising the ability to store binary data and delivering the ability to do something with it. Or promising X-Windows in the "next upgrade" versus delivering it now.

	User-defined functions in SQL and 4GL	Binary data via text and bulk datatypes	RDBMS kernel level "C" interface	X-Windows kernel level interface
Empress	✓	✓	✓	✓
Oracle				
Informix				
Sybase				

ID systems with photos, medical records with X-rays, continuous mapping, sophisticated CAD, GIS... just a few of the applications now a reality with Empress.

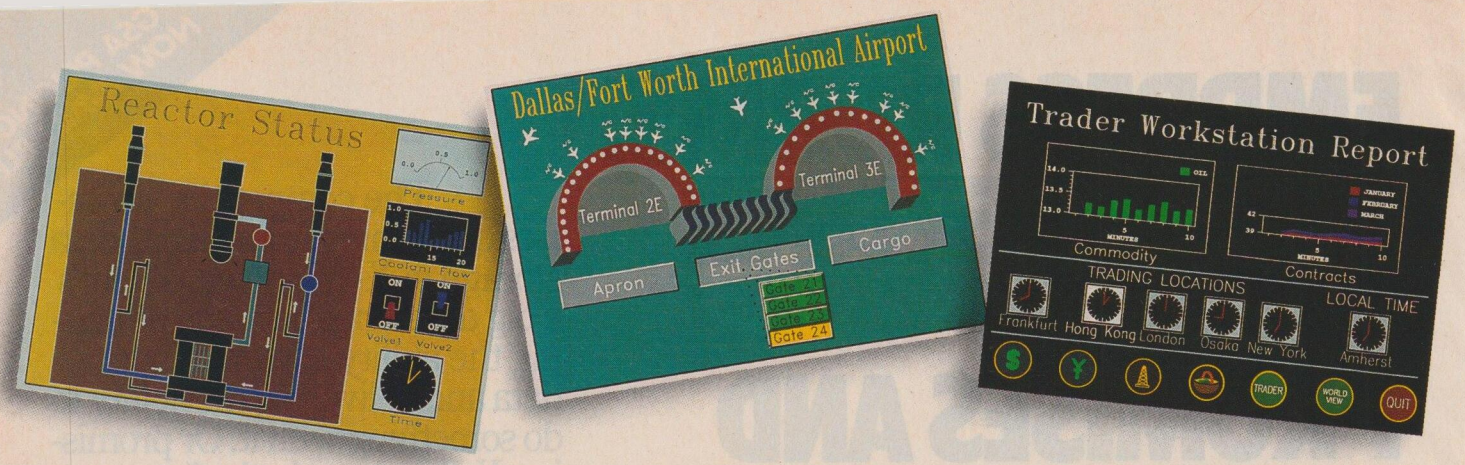
Empress, the scientific and engineering database, has defined what the world's most advanced RDBMS is all about. When you need an RDBMS to handle the serious work, compare Empress feature for feature with anybody. See the difference between promises and delivery.

EMPRESS

WHEN THERE'S SERIOUS WORK TO BE DONE, CALL 301-220-1919.

Empress Software (USA) Phone (301) 220-1919, • Canada Phone (416) 513-8888, U.K. Phone (44) 483-860001, • Japan Phone (81) 52-932-8580

CIRCLE NO. 218 ON INQUIRY CARD



TRUE GENIUS IS THE SIMPLE EXPRESSION OF COMPLEX IDEAS.

The most powerful software applications are those that are most easily understood. Like it or not, few people see the beauty of your code, the poetry of your program.

What they see is a screen. Some icons. Some charts, graphs, maps and symbols. They see that somehow, you have been able to get a computer to do something they want. And they see it through the graphical user interface.

Which is why we have created the DataViews® family of products. DataViews is the graphical user interface development environment that makes it easy for you to display dynamic data and for your user to interact with the application.

Whatever graphic image you need is easily created with DV-Draw®, our drawing editor. You can choose from DV-Draw's inventory of predefined input and output objects. And use it to develop images that dynamically represent real-time data.

To bind these images into your application, there's DV-Tools®. A library of C subroutines, DV-Tools allows you to create or optimize the interactive capabilities needed for effective high-level user input and customized real-time data output.

DV-Proto enables you to build working prototypes of your application without programming. To create graphic interfaces for NEXPERT® Object expert systems applications, we offer the DataViews/NEXPERT Subroutine Bridge™. For creating customized, application-specific drawing editors, there's our Graphical Editor Construction Kit™. And there's also a DXF conversion utility.

No matter the industry, a successful application is not only accurate, it's easy. And with DataViews, making it easy has never been easier.

DataViews, the leader in graphical user interface development environments. Simple.

For more information on the DataViews family of products, call 1-413-586-4144 Ext. 210.

DataViews
V.I. Corporation

V.I. Corporation, 47 Pleasant St., Northampton, MA 01060
V.I. Corporation (Europe) Ltd., Berkshire, England +44-734-756010

DataViews, DV-Draw, DV-Tools, DataViews/NEXPERT Subroutine Bridge and Graphical Editor Construction Kit are trademarks of V.I. Corporation.
NEXPERT is a trademark of Neuron Data Corporation.

CIRCLE NO. 57 ON INQUIRY CARD

LOW-COST PUBLISHING FOR THE MASSES

By Keith Edwards

Elan's Avalon Publisher competes admirably with the UNIX heavyweights

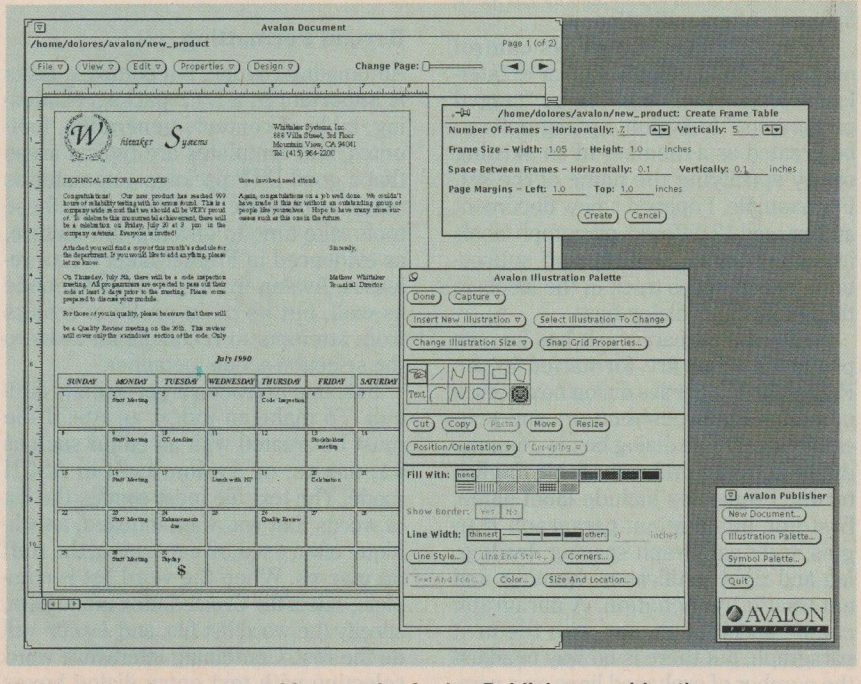
Avalon Publisher by Elan Computer Group is another product heralding the era of inexpensive desktop publishing (DTP). Products in this class range from the upcoming Microsoft Word for Motif to Island Graphics' Write/Paint/Draw and offer features comparable to the heavyweights in UNIX electronic publishing. Depending on your application, Avalon at $995 could be all the DTP software you need.

Avalon and Write/Paint/Draw are for UNIX users, not newcomers to computing. If you don't own a UNIX workstation but want DTP, you should investigate Apple and DOS products first. Plenty are available in retail stores, especially for Apple systems, and even Avalon and Write/Paint/Draw seem expensive by comparison.

Can Avalon compete against Interleaf and FrameMaker? From a price standpoint, yes. Interleaf's comparable product is the $795 Interleaf Slim TPS which lacks the "active document" technology of six-month-old Interleaf 5. The latter product costs $2,500 per license, but can cost up to $10,000 with additional modules. This price is fine in Interleaf's specialized markets, but in the general-purpose DTP market, it has helped make FrameMaker quite popular. FrameMaker itself sells for a flat $2,500–an attractive price for companies with annual DTP budgets of $10,000 or less.

Given this situation, vendors like Elan can cut into FrameMaker sales–especially at companies with moderate DTP requirements and high demand for licenses. Both Avalon and FrameMaker use floating license servers and thus, the two products are equal at this level. But FrameMaker offers more flexibility in the DTP applications it handles. FrameMaker is an established product, so you can trust it to most publishing tasks, including magazine layout, large books, and documentation projects, given features such as automatic indexing, mathematical function evaluation, and bibliography tools.

Avalon allows text and graphics to be created in the same document window and gives a good many features, but is not as feature-rich as FrameMaker. Avalon first shipped in November 1990 and was quickly followed with a 1.1 upgrade. In February of this year Elan announced that release 2.0 would be shipping by July. The pending release, says Elan, adds features including color support, more document exchange filters, database merging, and layout enhancements. Whether Avalon will rise to a more level footing with FrameMaker re-



Built around the concept of frames, the Avalon Publisher provides the Illustration Palette for adding graphics to basic desktop publishing projects.

mains a question. Release 1.1 does show, however, that Avalon can handle basic DTP jobs from fax cover sheets to reports, newsletters and brochures.

I tested Avalon on a Sun Microsystems SPARCstation 1 running SunOS 4.0.3 and the MIT distribution of the X Window System (X11.4). Avalon is designed to run under OpenWindows and adheres to Open Look style guidelines. Elan has also announced ports to Motif. My test system was equipped with 16 megabytes of memory. Installation took about three hours, primarily because the long font compilation process (which may not be so long on all systems). Otherwise installation was relatively painless, and used 28 megabytes of disk space for the program, fonts, tutorials, and clip art. Avalon also runs on Sun-3 and -4 systems and supports both PostScript and Hewlett-Packard LaserJet printers.

Consistent Interface

When started, Avalon greets you with its main pop-up menu and a blank document window. The main menu provides Open Look buttons to invoke graphics and symbol palettes, create new document windows, or quit the program. You can resize document windows using Open Look mouse techniques and simultaneously display as many document windows as your hardware supports.

Avalon's ease of use flows from its interface consistency. An object-oriented *selection-action* method directs the software. All distinct elements in Avalon are considered objects, including a sentence or paragraph of text, a drawn graphics object, a frame containing text and/or graphics, a page of a document, or an entire document.

To select an object, you click the left mouse button on the object. This is the simplest form of *selection-action*, but Avalon provides more complex methods. For example, names can be established for objects, or groups of objects, and then selected by name from a scroll box. After selecting an object, you pop up a menu, similar to those in Interleaf, associated with the object by pressing the right mouse button. The list of available actions varies, depending on the type of object selected.

All text is entered into frames in a document window which can be created, deleted, resized, and moved so that text can be repositioned and reshaped. There are two types of frames in Avalon: closed and linked. Closed frames accept a fixed amount of text and can be used for such tasks as creating headers and footers. If you fill a closed frame and continue to type, a warning message appears. Linked frames are connected to other frames. As you fill a linked frame to capacity, the text flows into the next frame in the link order.

You can have multiple link orders within a document and can name your link orders to operate on the frames within them as a group. A handy split operation lets you split a single frame into two or more linked frames in either horizontal or vertical fashion, making multiple-column documents a snap. Avalon also supplies an easy-to-use frame alignment option to line up frames with one another.

Text Formatting

Once you have text in your document the text actions menu can be used to format the text. Avalon provides up to 36 fonts as well as underlining and strikethrough capabilities. Additional paragraph-related functions, such as setting the interline spacing, justification, before- and after-paragraph spacing are also included. Avalon is also flexible in how you specify spacing parameters: you can use leading, baseline spacing, or blank lines.

On a higher level, Avalon operates on entire pages. The operations available include moving, deleting, and sizing pages. Various page properties can be set, including numbering and orientation. A page template consists of the page's property information, dimensions, locations, names of any frames on the page, position of the frames in the link order, and any text within a closed frame. Zooming is perhaps the most distinct page option in Avalon: if you find type to small to read, you can zoom up to 500 percent magnification.

Paragraph labeling allows control over sets of text objects, similar to Interleaf "components" and Frame "tagged paragraphs." In Avalon, a paragraph can be created as a member of an existing set by specifying the name of the set. For example, I opened a new document and created 12 different paragraph labels including para1, section, and subsection. Avalon keeps track of the labels in the Select Label dialog box.

Each labeled paragraph has its own properties that are formatted in the Paragraph Properties dialog box using a combination of pushbuttons and text-entry boxes. The dialog box is unintimidating and uses understandable English terms. Properties include label name, first line indentation, paragraph margins, inter-paragraph spacing, leading, left and right justification, kerning, and automatic hyphenation. A paragraph can be specified to stay with the next paragraph, but there is no way to adjust the number of orphaned lines on a paragraph-by-paragraph basis.

REVIEW HIGHLIGHTS

Avalon Publisher
Elan Computer Group, Inc.
888 Villa St., 3rd Flr.
Mountain View, CA 94041
415-964-2200
e-mail: `sales@elan.com`

Inexpensive and easy to use. Works well within the Open Look environment. Solid user interface.

Only adequate graphics. Little support for mathematical equations. Table of contents and index features need improvement.

Version: *1.1*
Systems: *Sun-3, -4, and SPARCstations running SunOS 4.0 or later.*
Licensing: *Floating license.*
Price: *$995 per license.*
Support: *10 a.m. to 8 p.m. EST, Monday through Friday, or via e-mail* (`support@elan.com`).
Warranty: *30 days.*

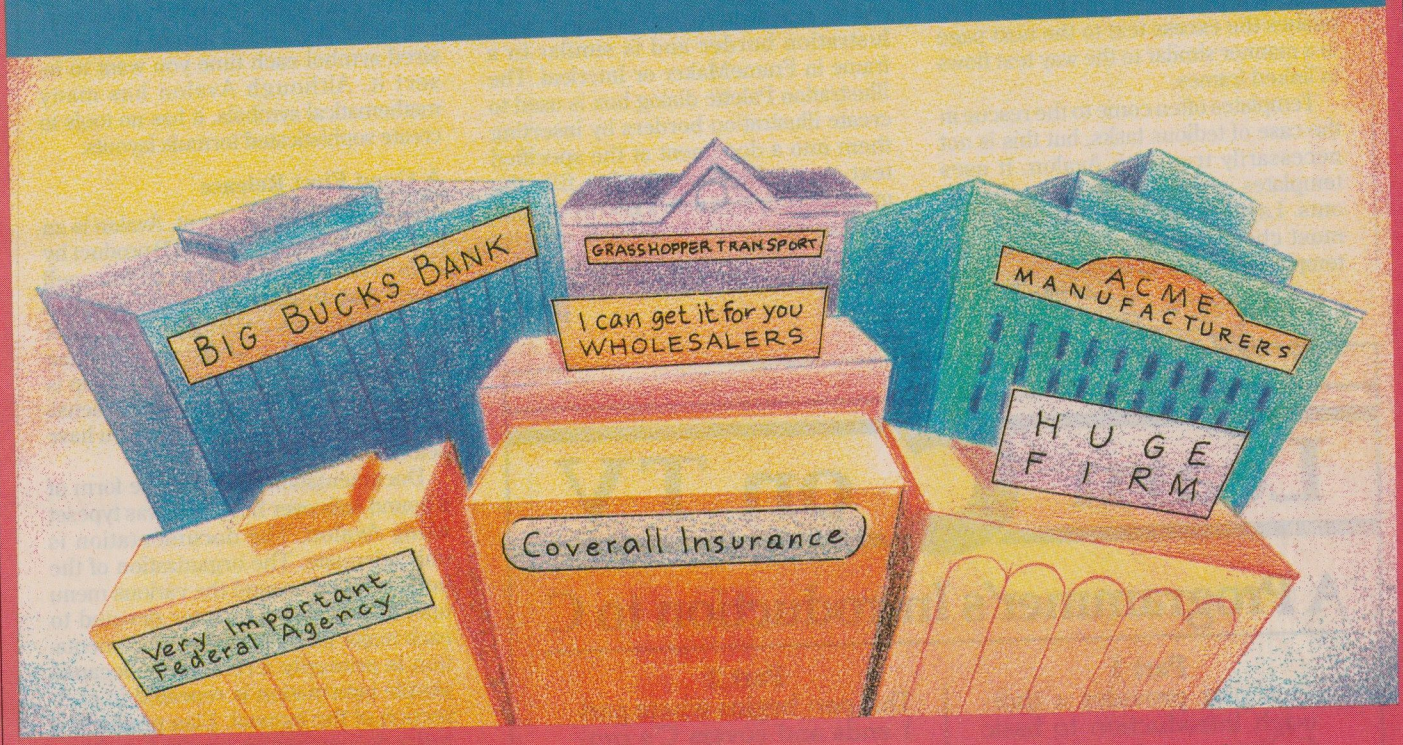
Beyond Formatting

Automating routine, but complex, tasks is important in a DTP package. Indexing, table of contents generation, footnotes, and templates are typical areas that a good DTP package automates as much as possible. Unfortunately, these tools take time to develop and mature, as evidenced in FrameMaker's 1.xx releases. Avalon fits into this early mode as well, but its main problem results from attempts to reconcile all tasks to the selection-action metaphor.

Indexing in Avalon is particularly difficult. To make an index, an ASCII file must be created with an editor such as `vi`, `emacs`, or Avalon itself in ASCII mode. The text file must contain the list of words that you want indexed, a technique often used by a master of the troff `mm` macros. When the word list is complete, select the Create Index menu item, specify the word list file, and Avalon will do the rest. Combining interactive word selection with text entry dialog boxes would have been a better method.

continued

NOW RISC IS OPEN FOR BUSINESS.



In the business world, speed alone won't get you very far. You need balance—of speed and overall systems performance. You need Digital.

Digital balances the power of our UNIX® based RISC DECsystem CPUs with high-speed I/O and memory, peripherals, and high-performance networking. That adds up to higher productivity for your commercial applications.

As a member of the Advanced Computing Environment (ACE) initiative, we incorporate industry standards—like OSF/Motif,® POSIX, and X/OPEN®—and give you applications portability **now**. So does our Network Application Support (NAS), software that lets you integrate multivendor applications. And of course, our UNIX-based DECsystems, featuring the 5100 and 5500, are backed by Digital's unparalleled service and support network.

Are you open to the power of Digital's DECsystems working for you? Call 1-800-343-4040, ext. 268. To become a Digital reseller or applications provider, call 1-800-343-4040, ext. 279

digital™

© Digital Equipment Corporation 1991. The DIGITAL logo is a trademark of the Digital Equipment Corporation. UNIX is a registered trademark of UNIX Systems Laboratories, Inc. OSF/Motif are trademarks of the Open Software Foundation. X/OPEN is a registered trademark of the X/OPEN Company Ltd. in the UK and other countries.

DIGITAL. THE OPEN ADVANTAGE.

The approach to creating a table of contents is just as awkward. You make a set of paragraphs with a label such as HEADING, but when Avalon converts the paragraph sets, whole paragraphs get copied into the table of contents document. Unlike FrameMaker, Avalon doesn't have any concept of sections and subsections. You can build these by using templates, but this is work you shouldn't have to do.

Avalon's handling of footnotes is a redeeming factor. It allows footnotes to be inserted from the Text Selection menu. When the footnote option is selected, a space opens up at the bottom of the page. Avalon marks the area with a special footnote symbol where the text is entered. If the text exceeds the available space at the bottom of the page, Avalon pushes the excess text to the next page in a manner similar to the way text flows in linked frames.

Templates often come to the rescue in the case of tedious tasks, but this is not necessarily true with Avalon. It uses templates in groups, which it calls layouts. Layouts are fairly awkward. You must choose a layout and assign the templates from it to various pages of a document before they take effect. A more powerful page layout control mechanism is needed, with some way to bind templates to physical page numbers or page types. The master page method in FrameMaker comes to mind.

Basic Graphics

Avalon provides basic graphics tools, with 11 drawing options, including lines, circles, ellipses, bezier curves, and text. You can group and ungroup graphical objects, turn on grid snap, change line widths, add fill patterns, and insert bitmaps and encapsulated PostScript files. In general, Avalon's graphics don't allow a lot of flexibility, but are adequate for simple drawings.

The canvas in Avalon is called the illustration border and is similar to a frame in FrameMaker or Interleaf. The Illustration Palette dialog box is used to create illustration borders by inserting them into a document at the specified text cursor location. Avalon fills the graphic work area with a grid by default. You can specify any reasonable scale for the grid, or hide it with features accessed via the Illustration Palette.

If you find Avalon's graphics lacking, you'll think highly of its file exchange filters. Avalon imports various file formats, including X Window Dump, Sun raster, PCX, TIFF (tagged-image file format), MacPaint, and Encapsulated PostScript. Avalon also has its own screen capture, which supports both windows and screen regions. After an image is captured, it can be imported directly into the software.

Symbol support is fairly simple in Avalon. Symbols are inserted into text or an illustration via selection from the Symbol Palette. The palette has Greek and mathematical symbols, the usual array of dingbats, and foreign characters. Too bad there is no way to re-map the keyboard to provide easy entry of symbol characters–you have to click the mouse on the desired symbol each time you want to insert it. Although Avalon has many mathematical symbols, it has no tools to create sophisticated formula layouts.

A Good First Release

Above any other comment, Avalon is an excellent first crack at a DTP product by Elan. There are complete online spell check and thesaurus options that use either American or British spellings. A minimum number of widow or orphan lines per page can be specified. Help is somewhat limited, but is context-sensitive based on the type of object you have selected.

Documentation comes in the form of a bound softcover book that was typeset using Avalon. The documentation is only adequate. The organization of the book is based around the various menu operations, with a chapter devoted to each major menu item. The documentation is primarily a reference, because simple information is repeated in each section of the manual. Elan promises a major documentation rewrite for release 2.0 of the product.

Avalon is a good product, but shows signs of its youth. It will be useful to anyone new to desktop publishing, or anyone with simple DTP needs.

The factor that impresses me most about Avalon is its simplicity. Once you understand the basic selection-action method and object hierarchy, you're set to do just about anything you want. With time, Avalon can only get better. You may not want to wait, however, as it's one of the best buys in UNIX desktop publishing today. ■

Keith Edwards is a doctoral student in computer science at the Georgia Tech Multimedia Computing Group. He has been a consultant to several companies over the past five years, specializing in UNIX and X Windows.

Learn C on TV

A Programmer's Introduction to C

Part 1

This part provides a thorough introduction to basic C Programming features. The course consists of 2 hours of video instruction and a 200-page manual.

- Data Types
- Operators
- Expressions
- Strings
- Functions
- Arrays
- Pointers

Part 2

This part begins where part 1 ends and covers C's project development features. The course consists of 2 hours of video instruction and a 170-page manual.

- File I/O
- Dynamic Memory
- Command Line Arguments
- Preprocessor
- Variable Scope
- Storage Class
- Structures
- Unions

Reduced Price!

Part 1 and Part 2 Together $295

Berkeley Decision/Systems
803 Pine Street
Santa Cruz, CA 95062
408-458-9708
Fax: 408-462-6355

CIRCLE NO. 86 ON INQUIRY CARD

What do all these computers have in common?

X.desktop™

As your business moves to Open Systems, don't miss out on a vital element – X.desktop, the graphical front-end with mouse, icons and pull-down menus that makes different UNIX computer systems look and behave the same.

The IXI X.desktop has emerged as *the* standard graphical user environment for all major UNIX platforms and works with character-based as well as graphical applications. Providing a consistent front-end for all the resources in your corporate network, X.desktop is vital to your system integration strategy.

This point and click interface is intuitive and powerful thanks to its advanced object-oriented technology and can be customized to meet the exact requirements of your workplace.

X.desktop is included with the OSF/Motif graphical user interface on your UNIX hardware or available from leading software distributors and system integrators. X.desktop is setting the standard for tomorrow's user interfaces . . .

"a snap to learn . . . I recommend that you buy X.desktop. Why wait any longer to taste the future of UNIX computing?"
Unix World, May 1990.

IBM
■ AIXwindows on RS/6000 & PS/2

UNISYS
■ PGE on U 6000/WS

SCO THE SANTA CRUZ OPERATION
■ Open Desktop

DELL COMPUTER CORPORATION
■ DELL Station 325 & 425E

□ Sun 3, Sun 4 & SPARCstation

HEWLETT PACKARD
□ HP9000/300 & 800

NCR
■ NCR Windows

digital
□ DECstation ■ 386/486

Tektronix
■ XD88 & TekXpress

NEC
■ EWS4800

Panasonic
■ BE Workstation

mips
□ RISCwindows

apollo
□ DOMAIN X Windows

OMRON
■ Luna Workstation

OSF/MOTIF™
OSF certifies that X.desktop is OSF/Motif Style Guide Compliant

OPEN DESKTOP

Call IXI today on 1-800-933 7557

IXI

Suite 300, 1737 North First Street, San Jose, CA 95112 Europe: +44223462131 Japan: +813 506 3676

■ X.desktop is an integral part of the vendor's Motif graphical user interface, □ X.desktop is supplied by distributors on this platform. X.desktop, IXI ... are trademarks of IXI Limited. All other products or brand names are trademarks or registered trademarks of their respective

CIRCLE NO. 260 ON INQUIRY CARD

DBMS Case Study:

Testing The F-15 Fighter

The Challenge

Every time he straps in, a military pilot puts his life on the line. He trusts his aircraft to respond instantly in split-second supersonic maneuvers. Constant testing and re-testing of his jet's hydraulic control systems are essential to assuring success—and survival.

The Application

HR Textron's F-15 STS Test Stand takes the computer-controlled hydraulic system that controls a jetfighter's flaps and ailerons through tests that simulate flight situations. A graphical user interface includes test fail dialogue boxes and menu trees that lead the operator through a complex series of diagnostic procedures. Limit-testing, self-calibration and archiving of results are handled by the test stand's integrated database.

The Solution

The system software for the test stand was developed using the db_VISTA III DBMS from Raima. Rich Rutkowski, Director of Engineering for the project, looked at the relational database products available and determined that they fell short of the design specifications. "Only db_VISTA III handled the complex data relationships, and also provided the speed and portability necessary for this application. We're not close to using all the power and flexibility db_VISTA III has to offer."

Over 90,000 missions were flown in the recent Persian Gulf conflict. Allied forces lost only five aircraft to mechanical failure — an incredible record made possible in part by exhaustive, thorough performance testing.

Whether in aerospace or in accounting, finance or manufacturing, critical applications demand the unique advantages of db_VISTA III:

- **Speed** — faster access to data
- **Portability** — supports most environments
- **Royalty-free** — increase your profits
- **Source Code Available** — total programming flexibility

Call Raima and find out how db_VISTA III can pass your next application development test.

Call: 1-800-db-RAIMA **Ask for extension 141**
(1-800-327-2462) In Washington State call: (206) 747-5570

db_VISTA™ III
Database Management System

RAIMA™ CORPORATION

UW061

Specifications Relational B-tree indexing. Network data model. Relational SQL query and report writer. Single & multi-user. Automatic recovery. Built-in referential integrity.
Supports: MS-DOS, MS Windows, UNIX, SCO UNIX, SunOS, QNX, VMS, Macintosh, OS/2 compatible. **Most C Compilers and LANs supported.**

Raima Corporation 3245 146th Place S.E., Bellevue, WA 98007 USA **(206)747-5570** Fax: (206)747-1991 Telex: 6503018237 MCI UW
Raima European Sales Office: 31 3480 31377 Fax: 31 3480 31277 **International Distributors: Australia:** 61 2 419 7177 **Austria:** 43 22 43 81861 **Belgium:** 32 2 734 9818 **Brazil:** 55 11 829 1687 **Central America:** 506 28 07 64 **Denmark:** 45 42 887249 **Finland:** 358 042 051 **France:** 33 1 46092784 **Germany:** 49 7022 34077 **Italy:** 39 49 8291239 **Japan:** 81 3 865 2140 **Mexico:** 52 83 49 53 00 **The Netherlands:** 31 2503 26312 **Norway:** 47 244 8855 **Singapore:** 65 298 2308 **Sweden:** 46 13 111588 **Switzerland:** 41 64 517475 **Taiwan:** 886 2 552 3277 **Turkey:** 90 1 152 0516 **United Kingdom:** 44 992 500919 **Uruguay:** 598 292 0959 **USSR:** 01 22 35 99 07; 812 292 7210

Copyright ©1991 Raima Corporation, All rights reserved. db_ is registered in the U.S.Patent and Trademark Office.

CIRCLE NO. 90 ON INQUIRY CARD

Update by Frank Hayes

WHO'S IN CHARGE OF INTERNATIONAL STANDARDS?

Who really sets international standards? Organizations from more than 80 different countries participate in formal international technical standards activities. They're not all active to the same degree, of course. Some from small nations function as little more than observers, while those from larger industrial countries are heavily involved.

It's no real surprise that the United States, Germany, Japan, France, Britain, and other countries with major producers of computers, take an active role in international standardization efforts. But do we really need so many standards organizations at the national and international levels? It may seem like a case of too many cooks spoiling the soup–after all, all that complexity means that international technical standards take years to develop.

But with standards groups ranging from official government agencies to private organizations, such as the American National Standards Institute (ANSI), international standards help solve the delicate political question of "who's in charge." If a standard is developed by only one country's national standards organization, it may be politically impossible, or even illegal, for those from other nations to participate. The international standards process gives each country an opportunity for its own say on how standards will be created.

The ISO View

In some respects, technical standards are similar to other international agreements. For example, the Berne Copyright Convention is an international agreement that sets standards for copyright protection. The Geneva Convention sets standards for treatment of prisoners of war.

Technical standards belong to a slightly different category. While treaties affect national laws, technical standards are also subject to the laws of physics and engineering. That means international technical standards must be combed through in exhaustive detail until all possible bugs have been found–both legal *and* technical.

Perhaps the most important technical standards organization is the one known in English as the International Standards Organization, or ISO. ISO consists of national standards organizations from 86 different countries; 72 are regular members and 14 are correspondent members that can observe at committee meetings.

The international process gives each country a voice

But many of the standards that bear ISO's name are actually developed jointly by ISO and another standards organization, the International Electrotechnical Commission, or IEC. The IEC specializes in electrical and electronics standards and consists of 39 national organizations concerned with electrical and electronics standards.

To avoid overlapping standards and duplicated efforts in areas where both ISO and IEC have interests, the two organizations have created a system of joint technical committees, steering committees, and working groups. Most computer-related international standards are specified under this system. For example, Joint Technical Committee 1, Steering Committee 21 (JTC1 SC21) is responsible for the OSI (Open Systems Interconnect) networking standards, while Posix is the work of Steering Committee 22, Working Group 15 (JTC1 SC22 WG15).

Nuts and Bolts

Who actually does the work on these international standards committees, and what do they do? Typically they're representatives of national standards organizations who are also specialists in an appropriate technical area. ISO working groups actually meet once every six months. Between meetings the members continue to work privately. A standards committee spends most of its time sifting through the details of a draft document, trying to resolve problems and objections, and incorporating comments that have been made by others.

Though far from glamorous, the work is certainly important. However, it's also expensive (international travel isn't cheap), and done entirely on a voluntary basis. These factors tend to limit membership in standards committees to representatives of countries (or, sometimes, companies) that can afford to send top technical people around the world twice a year.

In a few cases, the standards committee is actually trying to define a new set of standards, which can be an extremely complex task. For example, ISO has been working for several years to develop a set of specifications for OSI, a standard for networks.

Unfortunately, the completion of the OSI standard is not happening very quickly. The first step was relatively easy–a generalized seven-layer model for networks. But the project has bogged down in the process of specifying each of the seven layers in detail. As a result, several different nations have filled in the gaps with their own "government OSI protocols," or GOSIPs–a series of mutually incompatible temporary versions. And some vendors have created networking systems that use the seven-layer model, but don't match the rest of the incomplete ISO OSI specification.

In most cases, though, standards committees are either trying to turn existing practice into a formal standard, or adopt an existing standard that has been developed by an ISO or IEC member organization. The working group spends

its time trying to specify exactly what the existing practice or standard is and what parts of it should be adopted as an international standard. That's the case with ISO Posix, which is being developed for ISO by ANSI. At this point, the first part of that standard has been approved by both ANSI and ISO.

In theory, ANSI should have completed its work on Posix as a U.S. national standard before submitting it to ISO. But to save time, as sections of the Posix standard are completed, they're sent to ISO for review and comment. That way, any problems spotted by ISO's Posix working group can be repaired before the draft is formally submitted for ISO standardization.

No one group has complete control of standards

Even the Small Contribute

At this point, it may sound like the international standards process is dominated by the few large, rich nations that can afford to participate. If that's the case, why can't engineers from those countries just get together and set standards?

The simplest reason is that smaller countries *aren't* shut out of the process. Though they may not be represented in working groups, they do have the right to comment and vote on draft standards, which gives them much more input than they'd have into privately developed standards.

It's easy to forget that while a few countries develop computer systems, those systems have to meet the needs of a much wider range of users. UNIX, for example, was developed by a U.S. company, AT&T, primarily for its U.S. customers. As a result, UNIX is U.S.-oriented in many ways. For example, UNIX and its utilities are designed for ASCII characters and using other character sets, such as Arabic or Kanji, creates a nightmare for developers. Translating system messages into a different language requires completely recompiling the operating system in many cases.

Those weren't critical considerations for the Bell Labs researchers who first devised UNIX, even though they intended it to be a "portable" operating system. Even when U.S. companies ported UNIX and application software to languages that couldn't use the ASCII character set, they viewed the resulting complications as exceptions, not the usual situation.

But non-ASCII character sets and messages are exactly the sort of issue that international standards committees concern themselves with. In the interest of using computers to get work done efficiently, standards groups from non-English-speaking countries don't want to force their users to compute in a foreign language–regardless of the cultural blind-spots of U.S. engineers.

...Then Why National Standards?

If international standards work so well, why do we need *national* standards bodies? National standards organizations have a different job than the international system–they look out for their own countries' needs and economic interests.

In some cases, nationally developed standards are intended to support national industries. For example, the German national standards organization, DIN, is a familiar name to many computer users because of "DIN-style" electronics connectors that meet the German specifications. DIN is also well known for its standards for cameras and photographic equipment.

In other cases, national standards may be intended for use only within one country. Japan, China, Taiwan, and North and South Korea all have their own standards for computer character sets. Each of these countries uses a variation on Han characters, the ideographic (picture-based) writing originally from China. But because a character can have a different meaning or use in each culture, each country needs its own national standard–not really for international use.

Other Players

Along with ISO, IEC, and their joint technical committees, there are more specialized international groups that develop standards. Perhaps the most important of these to UNIX users is the Comite Consultatif International de Telegraphique et Telephonique, or CCITT. CCITT develops "recommendations" (rather than official standards) for telecommunications and messaging. CCITT members are national telephone companies, with one representative from each participating country. Among the CCITT recommendations important to UNIX users are the X.400 recommendation for message handling, X.500 for message addressing, X.25 for packet switching, and the V. series of standards for modems.

Finally, there are "unofficial" standards groups, such as the X/Open Company. X/Open was organized by computer vendors to develop open systems computer standards. It selects standards, then develops tests to make sure systems can match those standards.

How does X/Open's approach differ from those of conventional standards organizations? For one thing, it's faster. Without the endless meetings, drafts, and ballots of ISO committees, X/Open seems to work much more quickly than regular standards groups. But that's a misleading impression. One of the reasons X/Open works so fast is that it uses many standards that have already been created by other groups–including ISO. X/Open is also heavily geared toward commercial uses–it's an organization created by and for vendors. It tends to focus on product needs, rather than broader standards requirements. Those differences point to the fact that X/Open represents only one part of the need for international standards.

The Big Mix

Who's ultimately in charge of international standards? Large and small nations both have their say in ISO and IEC. Specialized industries such as telecommunications play their part in groups like CCITT. Vendors can have their own chance through unofficial groups such as X/Open.

In short, no single group has complete control of international standards, which is both the strength and the weakness of the way the standards are created. No *one* is in charge, so ironing out the details of every standard requires the slow, painstaking process of improving drafts and voting on the results.

Because no single group or country controls the process, international standards groups can make their selections from the widest possible range of choices. The many, sometimes-competing, sometimes-cooperating groups borrow heavily from each other, correct each others' mistakes, and challenge each others' assumptions. If the advantage of standards really is that there are so many of them, specialized private groups like X/Open make a useful complement to ISO, IEC, CCITT, and national standards organizations. As a result, the standards they produce are useful to the widest possible mix of users. ■

Up to date. Down to earth.

Changing the world. UNIX is changing the world of computers, the world of business—quite simply, changing the world. It's revolutionizing office automation. It's required for U.S. government computer contracts. It's the backbone of information strategies worldwide.

The information you need. That's why you need *UNIXWORLD*—the magazine that keeps you up to date on the rapidly changing world of open systems computing. Each issue brings you the latest product trends and technical advances that can affect your business. The inside story on some of the world's biggest high-tech companies. Easy-to-understand programming tips and tutorials that can help you and your company use UNIX to its fullest. And unbiased hardware and software reviews to help you invest wisely when you buy.

The whole UNIX-verse. *UNIXWORLD's* in-depth features go beyond dry technical facts, to show how the pieces fit together—to tell you what's important about the advances and the strategies that are changing your world. And *UNIXWORLD* consistently offers the freshest, most down-to-earth writing you'll find in any computer publication.

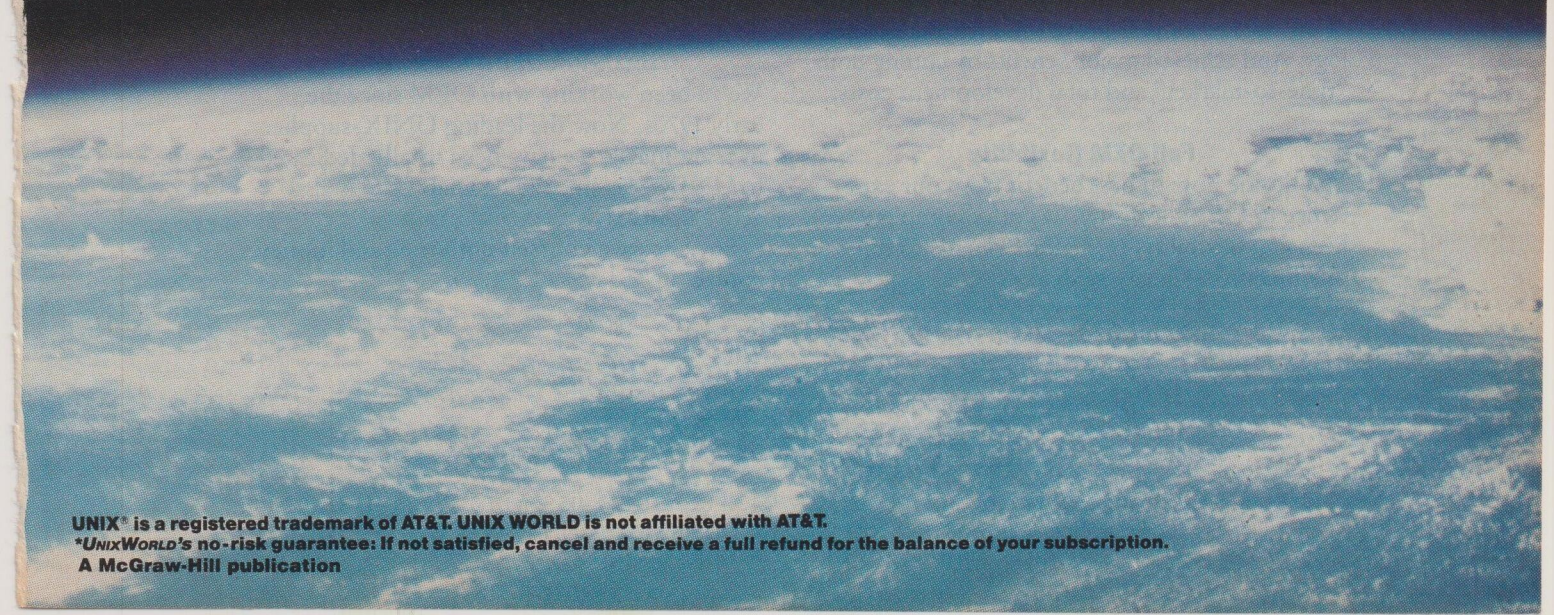
Subscribe and Save. Subscribe today, and receive the next 12 issues of *UNIXWORLD* for just half the regular newsstand price. Save even more by ordering for two or three years. You can't lose—every subscription to *UNIXWORLD* comes with a no-risk guarantee.*

1 year $18.00 (save 50%)
2 years $32.00 (save 55%)
3 years $42.00 (save 60%)

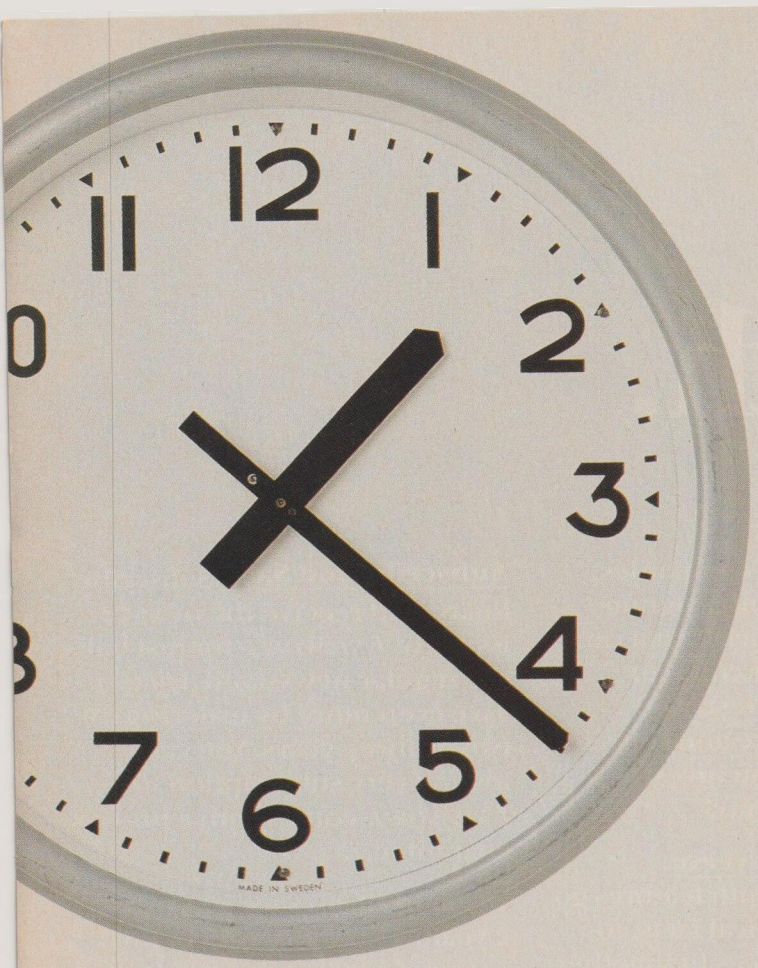
Subscribe now! Call toll-free:
1-800-257-9402 Ext. 29

UNIXWORLD
McGRAW-HILL'S MAGAZINE OF OPEN SYSTEMS COMPUTING

If you're into UNIX, you need *UNIXWORLD MAGAZINE.*



UNIX® is a registered trademark of AT&T. UNIX WORLD is not affiliated with AT&T.
***UNIXWORLD's* no-risk guarantee: If not satisfied, cancel and receive a full refund for the balance of your subscription.**
A McGraw-Hill publication



Two excellent reasons to contact Diab Data before developing your own UNIX-technology.

Save both time and money when developing your UNIX-based open systems.

How? By showing the same good sense as companies such as Unisys and Dynatech Computer Systems, who have already taken advantage of our advanced, well-proven and reliable technology. And achieved major benefits by cutting both "time-to-market" and total development costs.

Full OEM flexibility

You decide how to best benefit from our experience in OEM licensing. We offer complete licensing flexibility, from components to full manufacturing licenses.

Broad range of products

Our products range from RISC and CISC computer platforms, system software, communication hardware and software to compilers and mechanical design.

UNIX-knowhow since 1981

We've been working with OEM since the early 1970s. Now the leading UNIX-supplier in Scandinavia, we have been totally dedicated to UNIX ever since 1981. Diab Data is also active in POSIX.

So... to save yourself both time and money, contact us today.

DIAB DATA

Diab Data Inc, 323 Vintage Park Drive, Foster City, CA 94404, USA. Tel +1 415 571-1700. Fax +1 415 571-9068.
Diab Data AB, Box 2029, S-183 02 TÄBY, Sweden. Tel +46 8 638 94 00. Fax +46 8 792 05 61.

CIRCLE NO. 132 ON INQUIRY CARD

ARMANDT & CO BBN UNIX is a trademark of AT&T

NEW WAYS TO LOCK FILES AND RECORDS

New techniques for securing information within applications used by multiple users

By W. Richard Stevens

W. Richard Stevens is an independent consultant and an author whose next book is about advanced UNIX programming. This article is copyright by W. Richard Stevens in Tucson, Ariz. Portions of this article are adapted from his book, *UNIX Network Programming*, Copyright 1990 by Prentice Hall, and used with permission.

What happens when two processes try to update the same record in a database at the same time? Chaos can result if some type of record locking isn't used. When multiple processes need to share a resource such as a database, it is essential that some form of mutual exclusion exist so that only one process at a time can access the resource. One means of accomplishing this is through file or record locking. File locking prevents an entire file from being updated by more than one process and record locking allows a process to lock a specified portion of a file.

File and record locking under UNIX systems have been accomplished using various techniques. Early programs including UUCP and line printer daemons used different tricks to exploit characteristics of file system implementation. These methods were slow, however, and better techniques were needed for the database systems that were being implemented in the early 1980s.

In this article you'll learn techniques for different levels of file locking such as mandatory vs. advisory. You'll also see how current standards address file and record locking, and how they are implemented under System V and BSD 4.3.

In the Beginning...

In 1983, BSD 4.2 provided file locking with its `flock()` function. The 1984 version of XENIX for the IBM PC AT provided record locking through the `locking()` function. The 1984 /usr/group Standard defined the `lockf()` function. In 1984, System V Release 2 provided record locking through the `fcntl()` and `lockf()` functions.

Today, both the IEEE Standard 1003.1-1988 (Posix.1) and the X/Open Portability Guide Issue 3 (XPG3, 1988) specify that record locking be provided through the `fcntl()` function. Table 1 summarizes the different types of locking provided by the various standards and UNIX implementations.

For example, with the BSD line printer daemon, the process that places a job in the print queue to be printed at a later time by another process also assigns a unique sequence number to each print job. The process ID cannot be used as a sequence number, because it is possible for a print job to exist long enough for a given process ID number to be reused. The BSD print spooler has a file for each printer consisting of a single line that contains the next sequence number in ASCII. Each process that needs to assign a sequence number goes through four steps: it reads the sequence number file, it uses the number, it increments the number, and writes it back to the file.

In the time it takes a single process to execute these four steps, another process can perform the same steps. The result can be chaos. The solution is for a process to set a lock that says no other process can access the sequence number file until the first process has completed.

Listing 1A shows a simple program that illustrates the four steps. It calls the function `my_lock()` to lock the sequence number file at the beginning, and the function `my_unlock()` to unlock the file when it's done. To see what happens when locking is not used, Listing 1B shows a version of these two functions that provides no locking at all.

Listing 1C shows sample output from the Listing 1A `main()` and Listing 1B lock routines, after the sequence file has been initialized to contain a 1 (one). When the program (named `a.out`) is run twice using the shell command `a.out & a.out &`, you get output similar to that shown in Listing 1D, assuming you reset the sequence number to one

first. The output has been reformatted into two columns and spaces have been inserted between the consecutive lines of output from each process to make it more readable.

The result we have in Listing 1D is not what we wanted. The first process (PID 186) reads the file and prints its value (1). Before this value gets incremented and written back to the file, the second process (PID 187) reads the file and uses the CPU while it updates the sequence number to 10. Only then does the first process run again, resetting the sequence number back to 2. This occurs because the operating system has switched between the two processes somewhere in the middle of the four steps that update the sequence number. Note that each process reads, increments, and writes the sequence number file twenty times, creating exactly forty lines of output, but the sequence number continues to be incremented and reset to some earlier value by the other process. A way to allow a process to "lock out" other processes from accessing the sequence number file while it's updated is needed to avoid this situation.

Advisory vs. Mandatory Locking

Advisory locking means that the operating system knows which files have been locked by which processes. If a process has adequate permissions, it can ignore an advisory lock and write to a file that is locked.

Advisory locks are fine for cooperating processes. The programming of most system daemons is an example of cooperative processes–the programs that access a shared resource, such as the sequence number file, are under control of the system administrator. In our example, as long as the actual file containing the sequence number is not writeable by any process, a random process cannot write to the file while it is locked.

The other type of file locking, mandatory locking, is provided by some systems. Also referred to as enforcement-mode locking, mandatory locks mean that the operating system checks every **read()** and **write()** system call to verify that the operation does not interfere with a lock held by a process.

Posix.1, XPG3, SVR2, and BSD 4.3 only provide advisory locking. SVR3 and SVR4 are the only implementations that allow both advisory and mandatory locking. SVR3 and SVR4 institute advisory locking by default. To enable mandatory locking for a particular file, you must disable the group-execute bit and enable the set-group-ID bit for the file. Normally it makes no sense to have the set-group-ID bit on for a file without having the group-execute bit on as well. Therefore, the mandatory locking option was added to SVR3 in this way, without affecting any existing user software or requiring new system calls. (Regardless, many people think it's a kludge to add a

TABLE 1: Types of locking supported by various standards and UNIX system implementations.

	advisory	mandatory	fcntl()	lockf()	flock()
Posix 1003.1	x		x		
X/Open XPG3	x		x		
System V R2	x		x	x	
System V R3	x	x	x	x	
System V R4	x	x	x	x	
BSD 4.3	x				x

LISTING 1: Routines that demonstrate our locking example.

A. The **main()** *routine, used to read, display, increment, and write the updated sequence number:*

```
#include    <stdio.h>
#include    <sys/types.h>
#include    <fcntl.h>
#include    <unistd.h>
#define SEQFILE "./seqno"       /* file containing sequence no. */
#define MAXBUFF    4            /* max. size of seq. number +1 */
#define MAXCOUNT   20           /* max. seqno number count */
void    my_lock(), my_unlock(); /* keep lint happy */

main()
{
    char    buff[MAXBUFF + 1];  /* sequence number buffer */
    int     fd,                 /* sequence file descriptor */
            i,                  /* loop counter */
            n,                  /* byte count storage */
            pid,                /* process-id number storage */
            seqno;              /* current sequence number value */

    pid = getpid();     /* get PID for this process */
    if ((fd = open(SEQFILE, O_RDWR)) < 0) {
        fprintf(stderr, "Can't open %s\n", SEQFILE); exit(1);
    }
    for (i = 0; i < MAXCOUNT; i++) {
        my_lock(fd);                /* lock the file */
        lseek(fd, 0L, SEEK_SET);    /* rewind before read */
        if ((n = read(fd, buff, MAXBUFF)) <= 0) {
            fprintf(stderr, "read error\n"); exit(2);
        }
        buff[n] = '\0';     /* null terminate for sscanf */
        if ((n = sscanf(buff, "%d\n", &seqno)) != 1) {
            fprintf(stderr, "sscanf error\n"); exit(3);
        }
        printf("pid = %d, seq# = %d\n", pid, seqno);
        seqno = (seqno + 1) % 1000; /* next sequence number */
        sprintf(buff, "%03d\n", seqno);
        n = strlen(buff);
        lseek(fd, 0L, SEEK_SET);    /* rewind before write */
        if (write(fd, buff, n) != n) {
            fprintf(stderr, "write error\n"); exit(4);
        }
        my_unlock(fd);              /* unlock the file */
    }
}
```

B. Dummy locking functions which perform no locking:

```
void my_lock(fd)
int fd;
{
    return;
}

void my_unlock(fd)
int fd;
{
    return;
}
```

continued

Z/MAX XCHANGE®

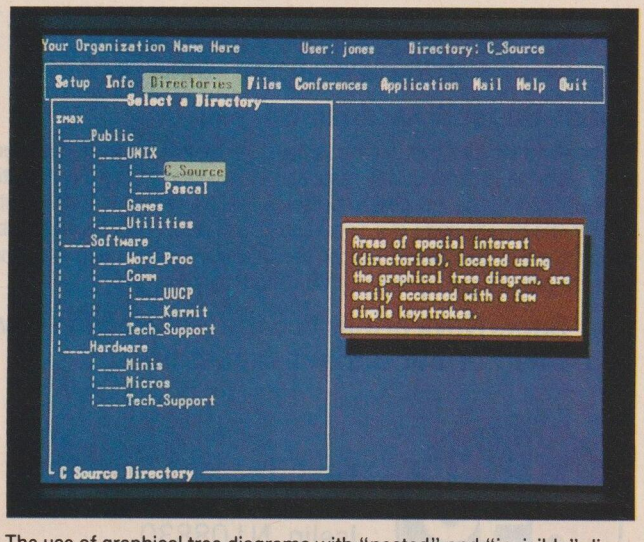
NEW Version 3.0
Now Available!

At Last...A Powerful, Integrated UNIX® Information Management System So Simple, Anyone Can Use It!

That's right! Z/Max XChange 3.0 is the first, fully integrated, UNIX application designed to help network administrators easily manage on-line communications and information distribution **with only a minimum knowledge of UNIX!** XChange takes full advantage of the power of UNIX and combines all the elements of information management into one very flexible, easy-to-use system.

Amazingly Easy To Use!

Z/Max XChange installs in less than 10 minutes and requires little knowledge of UNIX to load and operate! Context-sensitive HELP insures that users will be able to master XChange in no time at all! XChange utilizes intuitive screen menus with pull-down sub-menus and pop-up windows, replacing the obsolete "Bulletin Board" system of scrolling command lines.



The use of graphical tree diagrams with "nested" and "invisible" directories provides quick, easy access to key subject areas.

Powerful, Integrated Features!

With these powerful XChange features, system managers can easily track and administer workgroup projects, schedule and conduct meetings and distribute security protected information to specific users or user groups.

- Full graphical Bulletin Board functionality
- "Guest" login capability
- Real-time Conferencing
- Menu-driven Electronic Mail (e-mail)
- A unique "Applications" Command permits users to easily access other UNIX programs on the system
- "XQuery"—an integrated polling program with built-in statistical analysis
- A full-featured file editor
- "XNews"—provides on-line News Group capability
- Complete system transaction logging and accounting
- Multi-level/password security

These integrated features allow users to easily exchange information with others on the system...whether they are in the office, the field, or telecommuting from home!

The Total Solution For Your IMS Needs!

XChange's easy-to-use menu-driven features provide you with a more efficient method of managing and distributing information. Built-in flexibility insures that XChange will meet the IMS needs of any type of organization...business, governmental, educational, or public service.

Evaluate XChange for yourself! For a **FREE DEMO DISK** and more information, just call (315) 635-1882, fax (315) 635-1908 or write Z/Max, 8287 Loop Rd., Baldwinsville, NY 13027. It's that simple!

Z/MAX XCHANGE®

Setting The Standard In UNIX Information Management Software.

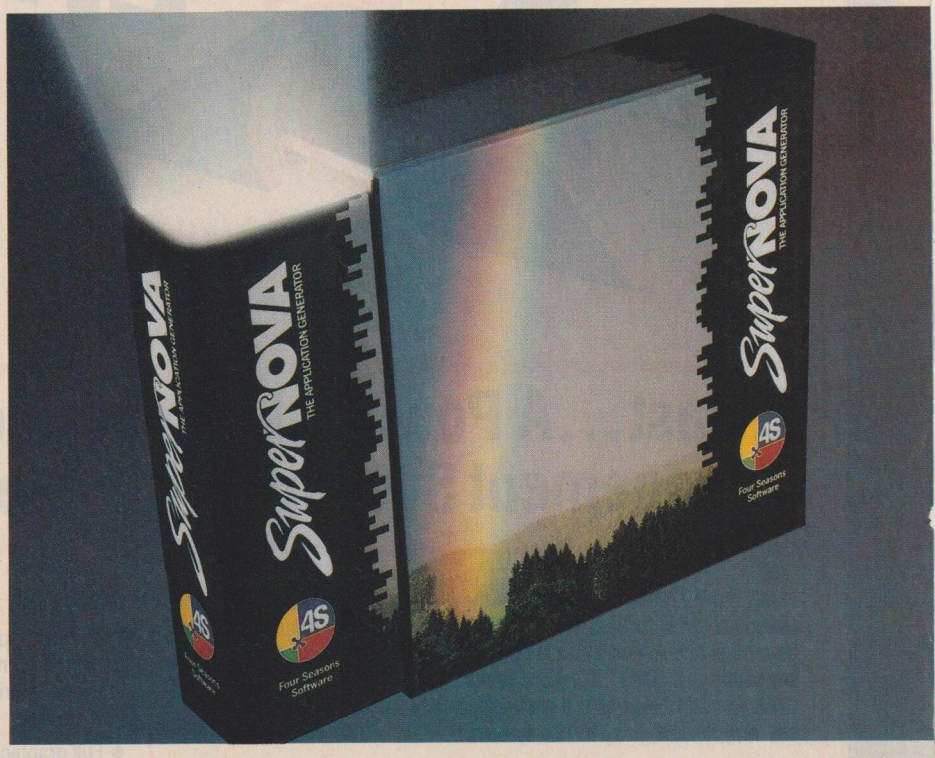
©1991, Z/Max Computer Solutions, Inc. UNIX is a registered trademark of AT&T.

CIRCLE NO. 221 ON INQUIRY CARD

The next step is...

SuperNOVA 2.0

The application generator and 4GL with transparent distributed processing facilities.



Amazing object-oriented application building capabilities

The SuperNova application generator represents a new approach to software development. Until now, software tools have helped us with some aspects of the building process. SuperNova goes all the way.

SuperNova allows you to paint the complete user interface and describe the database in full detail.

SuperNova allows you to create the application logic with a combination of painting and zooming into the application details. The complete development can be completed by this process without any need for procedural programming.

Works with your existing database or with flat files

SuperNova applications can run with several industry standard database packages. SuperNova interfaces to these database packages with no modification to the application. Changing the database type is possible without any change to the application itself – the ultimate in database independence.

SuperNova can work with your existing database, including Informix, Oracle and flat ASCII files. (Ingress and Sybase interface available soon).

An excellent user interface

SuperNova has a remarkably sophisticated user interface. SuperNova is easy to use for the creation of window-oriented systems, even on plain CRTs! The use of mouse, color and scroll bars is also available on the Sun workstation, X-windows and pc's.

Ultimate portability

SuperNova applications can be run on other hardware environments or operating systems without modification. The complete user interface updates itself automatically to the target environment.

A powerful library

SuperNova is also available as a program library interface, allowing you to create your own programs using a procedural language such as C, while using SuperNova to create the user interface. Every SuperNova command is available through the library interface, making huge data processing jobs, large simulation models and realtime applications possible.

Referential integrity and transaction control

SuperNova has automatic referential integrity features built in at the level of its data dictionary. Transaction processing is available on multi database transactions.

Full distributed processing facilities

SuperNova developed applications can run in a distributed mode on a network consisting of various system types. Database tables and data processing functions may be distributed. In this mode, the complete network is available as one virtual computer system.

SuperNova is available now

All these features are not a future ideal picture but the reality today. Nova is available now on a large number of Unix systems, on Xenix, Aix, Ultrix and others. It is available on VAX-VMS and MS-DOS.

What SuperNova does for you

SuperNova enables you to diminish your backlog of software development. The increase in productivity, reduction in maintenance costs, the ultimate portability and the low cost, represents a 100% return of your investment within the development of a single application. Your applications look better, and give the application builder the power of using windows, color and mouse without getting involved with the tedious details.

SuperNova brings you the features you always dreamed of but did not expect now.

UNIX™, AIX™, NOVA™, ORACLE™, UNIFY™, INFORMIX™, XENIX™, and **MS-DOS™, APPLE™, VAX/VMS™,** and **ULTRIX™,** and **SUN™** are trademarks of AT&T Bell Laboratories, IBM, Four Seasons Software Inc., Oracle Corp., Unify Corp., Informix Software Inc., Microsoft Corp., Apple Computer Inc., Digital Equipment Corp., and Sun Microsystems Inc. respectively.

Four Seasons Software
120 Wood Ave South
Iselin, NJ 08830
Phone: (201)-321-1650
Fax: (201)-287-4929

CIRCLE NO. 243 ON INQUIRY CARD

feature in this manner.) The **ls** command on SVR3 was enhanced to look for this special combination of file permission bits and display a lower-case "l" in the group-execute symbol position if the file is marked for mandatory locking.

File vs. Record Locking

The factor that differentiates record locking from file locking is its ability to lock a specified portion of a file. The term record locking is derived from other operating systems that enforce a record structure on disk files. In UNIX, a record is specified with a starting byte offset in the file and the number of bytes from that position. A better term for the UNIX variant is range locking, because the UNIX kernel does not support the concept of records. A locked record is actually a range of the file that is locked; whether this range has any resemblance to a record is up to the application.

Record locking under UNIX implies file locking because you can specify a record that consists of an entire file. File locking, however, does not imply record locking. The BSD 4.3 **flock()** function provides only file locking. However, all the other functions we describe in this article provide both options.

Record Locking using fcntl()

Listing 2A shows the prototype for the **fcntl()** function when it's used for record locking. The third argument is a pointer to a **flock** structure. This structure contains the type of lock (**l_type**) and the portion of the file that is being locked (**l_whence**, **l_start**, and **l_len**). The **l_whence** and **l_start** values are similar to the third and second arguments, respectively, of the **lseek()** function. If **l_whence** and **l_start** point to the beginning of the file, and if **l_len** is zero, the lock covers the entire file.

A read lock (**F_RDLCK**) is also called a shared lock and a write lock (**F_WRLCK**) is called an exclusive lock. Any number of processes can have a shared lock on the same range, but a shared lock prevents another process from obtaining an exclusive lock on a range. The file must be open for reading to obtain a read lock, and the file must be open for writing to obtain a write lock. The only time a process can get an exclusive lock on a range is when no other process has any type of lock on that range. Furthermore, while a process has an exclusive lock on a range, it prevents any other process from obtaining any type of lock on that range.

A shared lock allows you to read a file and ensures that no other process will change the data while you're reading, but will allow others to read the same portion of the file. On the other hand, if you're writing to a file you should have an exclusive lock.

If you don't want to block (wait) while you're trying to set a lock, the **F_SETLK** command should be used. If the **fcntl()** call would block, return is made with **errno** set to either **EACCES** or **EAGAIN**. Typically, however, most applications use **F_SETLKW**, which causes the process to block until the lock can be performed.

An example of a non-blocking lock is one in which a daemon assures that only a single copy of it is running. When the daemon starts, it executes a non-blocking lock on a specified file. If the lock succeeds, then the daemon is the only

Listing 1 continued

C. Sample output used when running one update process:

```
$ a.out
pid = 118, seq# = 1
pid = 118, seq# = 2
pid = 118, seq# = 3
[ 15 more lines of output ]
pid = 118, seq# = 19
pid = 118, seq# = 20
$
```

D. Sample output obtained when running two update processes simultaneously (by invoking **a.out & a.out &***). The results shown were obtained by reformatting the actual output into two columns with blank lines added to help distinguish the different processes:*

```
pid = 186, seq# = 1          pid = 186, seq# = 10
                             pid = 186, seq# = 11
pid = 187, seq# = 1
pid = 187, seq# = 2          pid = 187, seq# = 6
pid = 187, seq# = 3          pid = 187, seq# = 7
pid = 187, seq# = 4          pid = 187, seq# = 8
pid = 187, seq# = 5          pid = 187, seq# = 9
pid = 187, seq# = 6          pid = 187, seq# = 10
pid = 187, seq# = 7
pid = 187, seq# = 8          pid = 186, seq# = 12
pid = 187, seq# = 9          pid = 186, seq# = 13
pid = 187, seq# = 10         pid = 186, seq# = 14
                             pid = 186, seq# = 15
pid = 186, seq# = 2          pid = 186, seq# = 16
pid = 186, seq# = 3          pid = 186, seq# = 17
pid = 186, seq# = 4          pid = 186, seq# = 18
pid = 186, seq# = 5          pid = 186, seq# = 19
                             pid = 186, seq# = 20
pid = 187, seq# = 5
                             pid = 187, seq# = 11
pid = 186, seq# = 6          pid = 187, seq# = 12
pid = 186, seq# = 7          pid = 187, seq# = 13
pid = 186, seq# = 8          pid = 187, seq# = 14
pid = 186, seq# = 9
```

LISTING 2: Locking routines using fcntl() for System V, Posix, and X/Open.

A. The **fcntl()** *function syntax:*

```
#include <sys/types.h>
#include <unistd.h>
#include <fcntl.h>

int fcntl(int fd, int cmd, struct flock *lockptr);

Values for cmd:

    F_SETLK   Set or clear lock (nonblocking)
    F_SETLKW  Set or clear lock (blocking)
    F_GETLK   Test for other locks

struct flock {
  short  l_type;   /* F_RDLCK, F_WRLCK, or F_UNLCK */
  short  l_whence; /* SEEK_SET, SEEK_CUR, or SEEK_END */
  off_t  l_start;  /* relative offset in bytes */
  off_t  l_len;    /* length in bytes; 0 means lock to EOF */
  pid_t  l_pid;    /* returned with F_GETLK */
};
```

continued

Listing 2 continued

B. Locking functions written using the **fcntl()** *Posix-compatible locking routines:*

```
#include    <sys/types.h>
#include    <unistd.h>
#include    <fcntl.h>

struct flock    lock;

void my_lock(fd)
int fd;
{
    lock.l_type    = F_WRLCK;    /* use exclusive write lock */;
    lock.l_whence  = SEEK_SET;   /* start is absolute byte offset  */
    lock.l_start   = 0;          /* start at beginning of file */
    lock.l_len     = 0;          /* lock entire file */
    if (fcntl(fd, F_SETLKW, &lock) == -1) {
        fprintf(stderr, "can't F_WRLCK\n"); exit(5);
    }
}

void my_unlock(fd)
int fd;
{
    lock.l_whence = SEEK_SET;
    lock.l_start  = 0;
    lock.l_len    = 0;
    lock.l_type   = F_UNLCK;     /* unlock entire file */;
    if (fcntl(fd, F_SETLK, &lock) == -1) {
        fprintf(stderr, "can't F_UNLCK\n"); exit(6);
    }
}
```

continued

copy running, but if it fails the daemon can exit, because it knows that a copy is already running. This technique is used by the BSD **lpd** daemon.

The final command is **F_GETLK** which can be used to determine if the lock pointed to by the third argument can be created or not. If the lock cannot be created, the process ID of the process holding the lock is returned in the structure.

Listing 2B shows a version of locking functions that use **fcntl()**. If we link these functions with the Listing 1A **main()** routine and run the resulting executable with the shell command **a.out & a.out &**, we get the result shown in Listing 2C. Blank lines have been inserted at the points when the process ID changes and the output is shown multicolumn. The results show how the locking example should work–the sequence number increments up to 40 in order, even though the active process changes numerous times.

The lockf() Function

System V provides a **lockf()** function often used for locking by application pro-

CIRCLE NO. 166 ON INQUIRY CARD

MINICOMPUTER EXCHANGE

computer re-marketing specialists since 1973

Sell • Buy • Rent • Repair
Used & New Workstations

SUN
Silicon Graphics
APOLLO

Systems • Peripherals • Boards

HAVE YOU CONSIDERED
RE-MARKETED COMPUTERS?

We sell previously owned equipment—some used, some new—at major discounts from list price. All equipment is tested at our depot prior to shipment to you and carries our exclusive warranty. Systems can be configured to your specifications.

If you want value, availability, reliability, & experience—THINK ABOUT IT!

Call ... Tel: 408-733-4400
FAX: 408-733-8009

MINICOMPUTER EXCHANGE

CIRCLE NO. 35 ON INQUIRY CARD

grams. However, Posix.1 and X/Open have deprecated this function, and in most implementations `lockf()` is no more than an interface to `fcntl()`.

The main difference between `lockf()` and `fcntl()` is how the lock position is specified. The `lockf()` call establishes its locks from the current position of the file pointer, so a call to `lockf()` is usually preceded by a call to `lseek()`. With `fcntl()`, however, the lock's position is specified as part of the `flock` structure.

BSD 4.3 Advisory File Locking

BSD 4.3 provides advisory file locking using the `flock()` function. However, there is no relationship between the BSD `flock()` function and the structure of the same name that's used with `fcntl()`. This function applies to the entire file and there is no way to apply an advisory lock to a portion of a file.

Listing 3A shows the prototype for this function and the values for its *operation* argument. More than one shared lock can be applied to a file at any time, but a file cannot have both a shared lock and an exclusive lock, or multiple exclusive locks, at any time. This is similar to multiple locks with `fcntl()`. Listing 3B shows a version of locking functions that use the BSD 4.3 `flock()` function. To use Listing 3B with the `main()` function from Listing 1A on a

Listing 2 continued

C. Sample output using the `main()` *routine shown in Listing 1A and locking functions from Listing 2B after reformatting, as described in Listing 1D:*

```
pid = 308, seq# = 1          pid = 308, seq# = 22
                             pid = 308, seq# = 23
pid = 307, seq# = 2          pid = 308, seq# = 24
pid = 307, seq# = 3          pid = 308, seq# = 25
pid = 307, seq# = 4          pid = 308, seq# = 26
pid = 307, seq# = 5          pid = 308, seq# = 27
pid = 307, seq# = 6
pid = 307, seq# = 7          pid = 307, seq# = 28
pid = 307, seq# = 8          pid = 307, seq# = 29
pid = 307, seq# = 9          pid = 307, seq# = 30
pid = 307, seq# = 10
pid = 307, seq# = 11         pid = 308, seq# = 31
pid = 307, seq# = 12         pid = 308, seq# = 32
pid = 307, seq# = 13         pid = 308, seq# = 33
pid = 307, seq# = 14         pid = 308, seq# = 34
pid = 307, seq# = 15
                             pid = 307, seq# = 35
pid = 308, seq# = 16         pid = 307, seq# = 36
pid = 308, seq# = 17         pid = 307, seq# = 37
pid = 308, seq# = 18
pid = 308, seq# = 19         pid = 308, seq# = 38
pid = 308, seq# = 20         pid = 308, seq# = 39
pid = 308, seq# = 21         pid = 308, seq# = 40
```


Solutions for Software Development

Since 1977, Oregon Software has been one of the leading manufacturers of software development tools for C/C++ and Pascal. We offer the most technically sound compiler available, plus these benefits:

- Oregon Debugger allows source level debugging
- OSI's compiler directly compiles to object code
- Immediate attention to technical problems
- Portability across different platforms
- Adherence to language standards

CONTACT US TODAY AT 1-800-874-8501

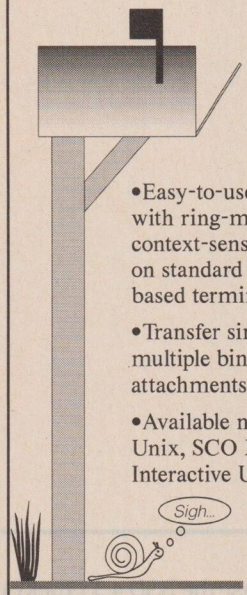
OREGON SOFTWARE

7352 SW DURHAM ROAD, PORTLAND, OREGON 97224

CIRCLE NO. 21 ON INQUIRY CARD

Easy-To-Use Unix Mail Is Here!

Tired of waiting for your mail system to arrive with the features you want?



CYMAIL Delivers Now!

- Easy-to-use interface with ring-menus, context-sensitive help; all on standard character based terminals.
- Transfer single or multiple binary attachments effortlessly.
- Available now for SCO Unix, SCO Xenix, and Interactive Unix.

Sigh...

$145.00

CYANTIC Systems
24 Mabelle Ave., Suite 3309
Toronto, Ontario
CANADA, M9A 4X8
Ph: (416) 234-9048 FAX: (416) 234-0477

CIRCLE NO. 17 ON INQUIRY CARD

JET SERIES TOOLKIT

Xenix/Unix System Recovery & Tuning Toolkit includes:

CTAR™ what "Tar" should have been (Master/Incremental, Compression, Data Verification, Special Files, Error Recovery, very fast, reliable.

Jet RestorEase™ restore SCO in 20 minutes (Alias CTAR Boot Recovery System)

UNDELETE true recovery of deleted files

JetOpt™ Disk defragmentor and optimizer

Probe, Patch, & Navigator explore - repair any aspect of the UNIX filesystem (Alias Jet Inode Editor)

Other **UniTrends** Products Include:

Codeshell convert shell script to binary executable

JetCom™ communication package

DOSTAR transfer large files from Xenix to DOS

UniTrends™

1601 21st Ave. N., Suite C-303
Myrtle Beach, S.C. 29577
803-626-2878
FAX 803-626-5202

Demos Available

CIRCLE NO. 127 ON INQUIRY CARD

LISTING 3: Locking routines for BSD 4.3.

A. BSD 4.3 advisory locking function syntax:

```
#include <sys/file.h>

int flock(int fd, int operation);

Values for operation:

    LOCK_SH             Shared lock (blocking)
    LOCK_EX             Exclusive lock (blocking)
    LOCK_SH | LOCK_NB   Shared lock (nonblocking)
    LOCK_EX | LOCK_NB   Exclusive lock (nonblocking)
    LOCK_UN             Unlock
```

B. Our locking functions written using the BSD 4.3 **flock()** *function:*

```
#include    <sys/file.h>

void my_lock(fd)
int fd;
{
    if (flock(fd, LOCK_EX) == -1) {
        fprintf(stderr, "can't LOCK_EX\n"); exit(5);
    }
}

void my_unlock(fd)
int fd;
{
    if (flock(fd, LOCK_UN) == -1) {
        fprintf(stderr, "can't LOCK_UN\n"); exit(6);
    }
}
```

LISTING 4: Our locking functions written using the link() system call.

```
#define LOCKFILE    "./seqno.lock"
#include    <errno.h>

void my_lock(fd)
int fd;
{
    int     tempfd;
    char    tempfile[30];

    sprintf(tempfile, "LCK%d", getpid());
    /*
     * Create a temporary file, then close it.
     * If the temporary file already exists, creat() will
     * just truncate it to 0-length, which is OK.
     */
    if ((tempfd = creat(tempfile, 0444)) < 0) {
        fprintf(stderr, "can't creat temp file\n"); exit(5);
    }
    close(tempfd);
```

continued

BSD 4.3 system, you must remove the reference to **<unistd.h>** and replace both occurrences of **SEEK_SET** with 0.

Other UNIX Locking Techniques

There are three features of the UNIX file system implementation that can be exploited to provide other types of locking. Techniques based on these features create and use an ancillary file to indicate if a process has the shared resource locked. If the ancillary file exists, the resource is locked by some other process, otherwise the calling process must create the ancillary file to lock the resource. The techniques use one of the following file system properties:

- The **link()** system call fails if the name of the new link to the file already exists.
- The **creat()** system call fails if the file already exists and if the caller does not have write permission for the file.
- Newer UNIX systems, including BSD 4.3 and System V, support options to the **open()** system call that cause it to fail if the file already exists.

The techniques based on the first two properties are applicable to all UNIX system versions and have been used since at least Version 7.

Before looking specifically at the techniques, let's discuss two approaches that won't work. The first is to create the an-

Specialix regretfully announces the 486 bottleneck.

Finally, I/O performance fast enough to give the 486 a run for your money.

Introducing the RISC-based Specialix RIO. Up to 128 users connected to each host card, with clusters up to a mile from the CPU.

Giving better performance and less CPU overhead than ever before.

For details on RIO, or our SI family of local connectivity solutions, call Specialix and raise your standards.

U.S.: (800) 423-5364 or (408) 354-4498
UK: (44) 932 354254
France: (33) 1 49 59 63 63
Germany: (49) 89 41 80 00 90
Singapore: (65) 749-1700
Australia (61) 2 960 2069

Intel & i486 are registered trademarks of Intel Corp. All other trademarks are acknowledged.

Specialix

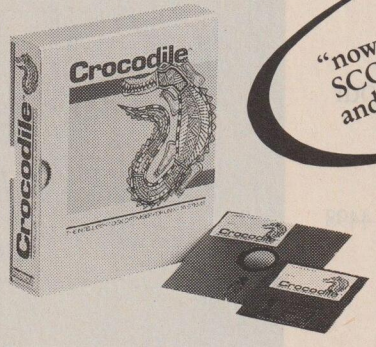
THE MOST INTELLIGENT I/O SOLUTION

CIRCLE NO. 209 ON INQUIRY CARD

UNIX works faster if your files aren't scattered like this.

What a mess! No matter how powerful your system is, it's wasting valuable time searching for files scattered all over your disk. No wonder your UNIX response times are down. Until now.

Crocodile, the first disk optimizer for UNIX, transforms this chaos into perfect order. It's the easiest way to make your system perform up to 5 times faster. And it's the only way to intelligently order files on disks.



"now available for SCO XENIX 386 and SCO UNIX"

Start working faster today! Call toll free West Coast 1 800 347 7979 or East Coast 1 800 729 2342 for further information.

technologies
stallion
Harnessing the power of UNIX

Stallion Technologies Inc. 983 University Avenue,
Building B, Suite 104, Los Gatos CA 95030
Tel: (408) 395-5775 Fax: (408) 395-6396

Stallion Technologies Pty Ltd—Australia
Tel: 61 7 870 4999

UNIX is a registered trademark of AT & T. Stallion is a registered trademark of Stallion Technologies. Crocodile is a trademark of Stallion Technologies. SCO is a registered trademark of The Santa Cruz Operation. XENIX is a registered trademark of Microsoft Corporation.

CIRCLE NO. 191 ON INQUIRY CARD

ANV 0023

Listing 4 continued

```
    /*
     * Try to rename the temporary file to the lock file.
     * This will fail if the lock file already exists
     * that is, if some other process already has a lock.
     */
    while (link(tempfile, LOCKFILE) < 0) {
        if (errno != EEXIST) {
            fprintf(stderr, "link error\n"); exit(6);
        }
        sleep(1); /* wait a second before trying again */
    }
    if (unlink(tempfile) < 0) {
        fprintf(stderr, "unlink error for tempfile\n"); exit(7);
    }
}
void my_unlock(fd)
int fd;

{
 if (unlink(LOCKFILE) < 0) {
        fprintf(stderr, "unlink error for LOCKFILE\n"); exit(8);
    }
}
```

LISTING 5: Locking functions written using the `creat()` system call.

```
#include    <errno.h>
#define LOCKFILE    "./seqno.lock"

void my_lock(fd)
int fd;
{
    int tempfd;

    /*
     * Try to create the lock file, with all write
     * permissions turned off.  If the lock file
     * already exists, the creat() will fail.
     */
    while ((tempfd = creat(LOCKFILE, 0)) < 0) {
        if (errno != EACCES) {
            fprintf(stderr, "creat error\n"); exit(5);
        }
        sleep(1);
    }
    close(tempfd);
}

void my_unlock(fd)
int fd;
{
    if (unlink(LOCKFILE) < 0) {
        fprintf(stderr, "unlink error for tempfile"); exit(6);
    }
}
```

cillary file and use it as an indicator that a process has a lock on some other file. This won't work because the **`creat()`** system call does not fail if the file already exists and is writeable by the calling process. If the file does exist, **`creat()`** truncates the file to zero length.

Another approach that doesn't work is to test if the ancillary file exists, and if not, to create the file. For example, using the command:

```
if ((fd = open(lockfile,0)) < 0)
  fd = creat(lockfile,0644);
```

This approach doesn't work because it requires two separate calls: one to test if a file exists–**`open()`**–and one to create the file if it does not exist–**`creat()`**. In the time between the two function calls, another process can do the same test and create the same file. When the first process that was interrupted runs again, it calls **`creat()`**, but no error occurs even though the file already exists.

Using `link()`, `creat()`, and `open()`

Our first correct implementation relies on the fact that **`link()`** fails if the name of the new link to the file already exists. **`link()`** takes an existing file name and creates another directory link to that file. A UNIX file can have any number of

NCR Tower ?

PERFORMANCE PROBLEMS?

We provide many high performance enhancement products for the NCR Tower family:

- System Memory Modules.
- Internal & External SCSI Disks (380 MB to 1.2 GB)
- SCSI Tape Drives (150 MB & 2.3 GB).
- High speed/low overhead TCP/IP, Ethernet Networks.
- Replacement CPU upgrades; Math Co-Processors.

Ask how these products have doubled the Tower performance for many customers.

Sea Change Corporation
6695 Millcreek Drive, Unit 8
Mississauga, Ontario
Canada, L5N 5R8
Tel: 416-542-9484
Fax: 416-542-9479

"THE NCR TOWER EXPERTS"

CIRCLE NO. 64 ON INQUIRY CARD

CTAR

HOW VALUABLE IS YOUR DATA?

*Protect it with **CTAR** (See-Tar), the most versatile archiving software available for **UNIX, XENIX, and AIX** based computer systems.*

- *Large Blocking for increased speed.*
- *Master Backup and Incremental Backup capability.*
- *Three level switchable Data Compression.*
- *User friendly Menu Interface, conventional Command Line, or Automated Nightly operation.*
- *Error Recovery, Automatic Cataloging, and Media Verification.*
- **NEW!** *Boot Recovery System for* **SCO UNIX and SCO XENIX** *versions can restore from full system failure in minutes, not hours.*

*Call, write, FAX or email today for more information on **CTAR** and our other productivity enhancement tools.*

Dealers/Distributors Welcome!

MICROLITE
CORPORATION
1021 Sutherland Street
Pittsburgh, PA 15204-1751
Tel: (412) 771-4901
Fax: (412) 771-7105
Email: uunet ! mlite ! info

Product Names are Trademarks or Registered Trademarks of their respective holders.

CIRCLE NO. 176 ON INQUIRY CARD

LISTING 6: Locking functions written using the open( ) system call with both O_CREAT and O_EXCL specified.

```
#include    <sys/types.h>
#include    <fcntl.h>
#include    <errno.h>

#define LOCKFILE    "./seqno.lock"
#define PERMS       0666

void my_lock(fd)
int fd;
{
    int tempfd;

    /*
     * Try to create the lock file, using open() with both
     * O_CREAT (create file if it doesn't exist) and O_EXCL
     * (error if create and file already exists).
     * If this fails, some other process has the lock.
     */
    while ((tempfd = open(LOCKFILE, O_RDWR|O_CREAT|O_EXCL,
                          PERMS)) < 0) {
        if (errno != EEXIST) {
            fprintf(stderr, "open error for lock file\n");
            exit(5);
        }
        sleep(1);
    }
    close(tempfd);
}

void my_unlock(fd)
int fd;
{
    if (unlink(LOCKFILE) < 0) {
        fprintf(stderr, "unlink error for lock file\n");
        exit(6);
    }
}
```

links, that is, names that refer to the same file. Unlike **creat()**, if the new path name specified by **link()** already exists, an error is returned and **errno** is set to **EEXIST**.

One technique is to create a unique temporary file with a name based on the process ID of the process. Once this file is created, we try to form another link to it, using the "well-known" name of the ancillary lock file. If the **link()** call succeeds, then the calling process has the lock, and the lock file is pointed to by two directory entries–the temporary file name based on the process ID and the well-known name of the lock file. The temporary file name can now be removed, leaving only a single link to the file. Listing 4 shows a version of the lock functions that use this approach.

The second technique takes advantage of the behavior that **creat()** returns an error (**EACCES**) if the file exists and write permission is denied. As mentioned earlier, **creat()** normally truncates an existing file to zero length if it already exists. But, if the file's access permissions don't allow writing to the file for the process calling **creat()**, it fails. There is one caveat to this technique in that this error is not returned if the process has superuser permissions, because the superuser can write to any file, regardless of the file's access permissions.

Our technique is to create a temporary lock file with all write permissions disabled. If the **creat()** succeeds, the calling process knows it has the lock and the sequence number file can be safely modified. The unlock operation removes the temporary lock file, because the **unlink()** succeeds if the caller has write permission in the directory. The caller does not need write permission for the file being unlinked. Listing 5 shows the lock functions that use this technique.

The third technique uses the option flags for **open()** that are provided by most recent UNIX systems, including System V and BSD 4.3. If both **O_CREAT** and **O_EXCL** are specified, the **open()** fails if the file already exists, otherwise the file is created. Posix.1 specifically states that the test for the existence of the file and the creation of the file if it doesn't exist, must be atomic with regard to other processes trying to do the same thing. Locking functions for using this technique are shown in Listing 6.

Points to Consider

There are many points to consider when using the three techniques discussed above:

1. The first two techniques should work with any UNIX system implementation.
2. These techniques take longer to execute than actual file locking functions, as multiple functions (such as **creat()**, **close()**, **link()**, and **unlink()**) are required, and several file system operations are performed.
3. An ancillary lock file is required, in addition to the file containing the resource that is shared. In our example, we need both the sequence number file and the ancillary lock file. Because the lock file must be created each time it is needed, a single file cannot be used.
4. Ancillary files such as a lock file might be left around after a system crash and some technique must be devised to accommodate this possibility by removing old lock files.
5. The **link()** function in the first technique cannot create a link between files on different logical file systems, so the temporary file cannot normally be placed in the **/tmp** file system. Many larger UNIX systems place the **/tmp** directory in its own file system.
6. The second technique does not work if the processes competing for the resource run with superuser privileges.
7. When the ancillary lock is owned by another process, the process wanting the lock doesn't know when to check again. In our examples we wait for one second. The ideal condition is for the process wanting the lock to be notified when the lock is available.
8. The process that obtains the lock can terminate, intentionally or unintentionally, without releasing the lock.

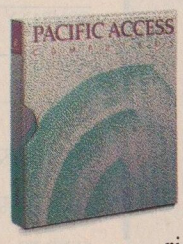
Cases four and eight require some technique for another process to determine when an existing lock is not in use. A common solution is to assume a timeout period based on the application (a few minutes, perhaps) and remove locks that are older than this. The last-access time or last-modify time in the **stat** structure for the lock file can be used to determine how long a lock has been around. Because this technique fails if the resource is in use for longer than the timeout period, a solution to this is to store the process ID of the process that has the lock in the lock file. This way, the **kill()** function, with a signal argument of zero, can be used to determine if the process is still in existence.

Given the potential problems with these older techniques, true record locking or file locking methods should be used when available. ■

EZ-ADMIN sends new Sun users a clear message

Announcing the menu-driven package that makes Sun's SPARCstation administration a welcome asset.

The processing power and brilliant displays of the Sun Microsystems SPARCstations are attracting new users to the world of UNIX workstations every day. This transition has usually meant frustrating hours with a UNIX manual or expensive visits from consultants. Now, for the first time, newcomers to the Sun SPARCstation can set up and administer their own systems from the first day.



A few of the tasks that EZ-ADMIN makes easy:

By using an intuitive, menu-driven approach, EZ-ADMIN lets you easily:

- Connect to hosts and peripherals.
- Add, update or delete users and access controls.
- Perform network administration.
- Manage mass storage systems more easily.

EZ-ADMIN automatically checks for a broad range of errors. And, there are two levels of password protection to minimize the risk of unauthorized changes to your system.

Pacific Access Computers regularly updates EZ-ADMIN plus you can easily customize the package to meet your site's needs.

To make your new Sun users feel welcome, send for EZ-ADMIN today.

PACIFIC ACCESS
COMPUTERS
Making Systems Mesh

2945 Kilgore Road, Rancho Cordova, CA 95670
(916) 635-9300 (800) 648-6161
Offices nationwide

Value Added Reseller

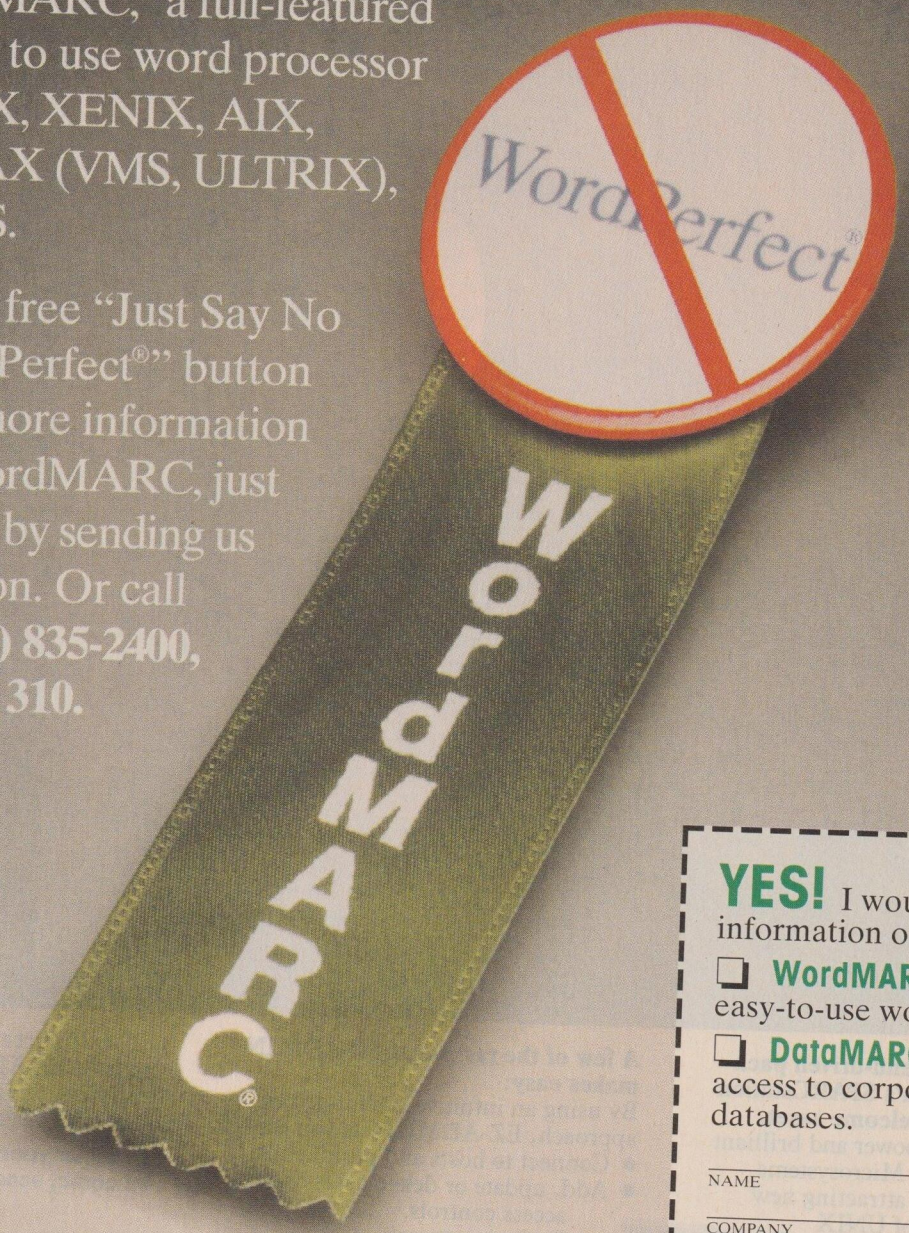
"All brand products and service names mentioned are the trademarks or registered trademarks of their respective owners." Authorized Minority Woman-Owned Business.

CIRCLE NO. 240 ON INQUIRY CARD

JUST SAY NO!

Find out why you should say "Yes" to WordMARC,® a full-featured and easy to use word processor for UNIX, XENIX, AIX, DEC VAX (VMS, ULTRIX), and DOS.

For your free "Just Say No To WordPerfect®" button and for more information about WordMARC, just say "Yes" by sending us the coupon. Or call us at **(800) 835-2400, extension 310.**



WordMARC

It's not just for words.©

YES! I would like more information on these products:

❑ **WordMARC,** a full-featured, easy-to-use word processor.

❑ **DataMARC,** for elegant access to corporate data and to databases.

NAME

COMPANY

ADDRESS

CITY STATE ZIP

TELEPHONE FAX

WHO BUYS SOFTWARE AT YOUR COMPANY?

SEND TO: **WordMARC International Corp.**
940 East Meadow Drive
Palo Alto, CA 94303

OR CALL: (415) 813-8989
Fax (415) 813-8950

WordPerfect is a trademark of WordPerfect Corporation. WordMARC is a registered trademark of WordMARC International Corp. All other product names are trademarks of their respective holders. ©1991 WordMARC International Corp.

Dr. Rebecca Thomas

WORD SPELL, SHELL STRING ROUTINES, BOURNE SHELL LOG

This month, Brian Hathaway contributes a useful little tool for spell checking one or more words interactively. Peter Lacey submits a script that provides some handy string manipulations useful in shell scripts. Rene Mount has a script useful for logging command lines entered by a Bourne shell user. Enjoy.

One Word at a Time

Dear Dr. Thomas:

Here is a shell script for doing a spell check on individual words entered either on the invocation command line or in response to a prompt. I find this program useful when I'm using an editor and want a quick check on a particular word.

The **ws**, word spell, script [see Listing 1] uses two temporary files: one contains the words to be checked and the other any misspelled words detected by the UNIX **spell** utility. These temporary files are removed by the **trap** command when the program exits "normally" or is interrupted by a signal. This script also passes options on to UNIX's **spell** program so that you can work with that command's full functionality. The script reports whether or not the words occur in the dictionary, which includes a user-specified "local dictionary."

The **ws** script was originally written and checked using UNIX System V, Release 3.1.1 on an AT&T 3B2/600.

Brian J. Hathaway
AT&T
Pittsburgh, Pa.

LISTING 1: You can wrap a script around the UNIX spell utility to check individual words. Here's one implementation:

```
 1  :
 2  # @(#) ws checks the spelling of words from the command line.
 3  # Author: Brian Hathaway, September 1990
 4  # Modified by Becca Thomas, March 1991
 5  # set -x # Uncomment for debugging
 6  # Define variables:
 7  Spellopts=""    # Must initialize spell options string to null
 8  TmpA=/usr/tmp/`basename $0`a$$  # temp file for input words
 9  TmpB=/usr/tmp/`basename $0`b$$  # temp file for misspelled words
10  Usage="Usage: $0 [spell-options] [word ...]" # document usage
11  # Trap to remove temporary files on exit:
12  trap 'rm $TmpA $TmpB 2>/dev/null;exit' 0 1 2 3 15
13  # Collect options for spell command:
14  for Arg in $*; do
15      case $Arg in
16          -*|+*)  Spellopts="$Arg $Spellopts"
17                  shift ;;
18      esac
19  done
20  # Collect words to check:
21  case $# in
22      0)  cat <<- EOF # use in-line redirection to display prompt
23          Enter words, one to a line.
24          Enter control-D to terminate input.
25  EOF
26          while read Word; do      # read word from stdin
27              echo $Word >>$TmpA  # append word to temp file
28          done ;;
29      *)  for Word in $*; do       # for word on command line
30              echo $Word >>$TmpA  # append word to temp file
31          done ;;
32  esac
33  # Leave program if no words to check:
34  [ ! -s "$TmpA" ] && { echo $Usage >&2; exit 1; }
35  # Create list of misspelled words
36  spell $Spellopts $TmpA > $TmpB
37  # Search misspelled list for each input word:
38  for Word in `cat $TmpA`; do
39          if fgrep -x $Word $TmpB >/dev/null; then    # word matched
40              echo "$Word is not in dictionary."
41          else                                        # not matched
42              echo "$Word is in dictionary."
43          fi
44  done
```

Strung Out

Dear Dr. Thomas:

As a self-taught UNIX user and shell programmer, I've found that the best way to learn UNIX is to constantly browse through the system and the reference manuals, understanding a little more each time. Until recently the only use I had for the **expr** command was to perform simple arithmetic. Then I stumbled upon a script that used **expr** to strip off the first character of a string. It occurred to me that, with a little work, I could develop a canned set of routines to perform some standard string functions that are lacking in the Bourne shell. So, I broke out the *User's Reference Manual*, opened to the **expr(1)** page, and wrote the script I named **string**. This script was developed and run under SCO XENIX 2.3.2 on a Dell System 325.

[*Doctor's notes:* Part A of Listing 2 depicts the source code for **string** and Part B shows sample usage.]

My **string** program requires one of four options and their arguments. The options specify the following behavior for **string**:

- **-n** tells **string** to return the length of the string as a decimal number.
- **-l** *N* has **string** return the left-hand *N* characters of a string. If the *N* is zero, no characters are returned. If *N* is greater than the length of the string, the entire string is returned without trailing spaces.

continued

■ **-r** *N* specifies that **string** return the right-hand *N* characters of a string. If *N* is zero, no characters are returned. If *N* is greater than the length of the string, the entire string is returned without leading spaces.

■ **-s** *N1 N2* causes **string** to return *N2* characters from the string starting at *N1*. If *N1* is greater than the length of the string, an error is returned. If *N1* + *N2* is greater than the length of the string, the right-hand substring starting at *N1* is returned.

Description of **string** *operation:* After setting a trap for termination signals and then defining error messages, **string** builds a series of functions and processes the command-line arguments. If available, **getopts(1)** is used to check for a valid command-line option letter. Note that **getopts(1)** doesn't process any option arguments, but is used to specify the appropriate function to be called later by **eval**. The functions themselves process all the remaining arguments.

Because three options take numerical integer arguments, we provide the **testint()** function to make sure the argument is valid. Here, **expr** will return a zero exit status (in **$?**) if the addition of zero is successful (because the argument is an integer).

The string manipulation functions use **expr** with the colon-matching operator (:). The first argument is the specified string and the second a regular expression. For **strlen()** the regular expression **'.*'** causes **expr** to return the number of characters in the string argument (stored in variable named **String**). The other functions use a regular expression consisting of the appropriate number of dots in escaped parentheses. In this case, **expr** returns a portion of the string. The dots are generated by the **makedot()** function under the direction of an integer argument.

For **getleft()** if the integer argument specifying the return character count is greater than the string length, the return count is fixed at the string length. With **getright()** the number of characters to discard is computed as the difference between the string length and the specified character count. This "exclude count" is used to generate the dots, so the remaining characters, if any, are returned.

The **substr()** function verifies that the starting value isn't greater than the string length.To make the return string include the starting value character, you need to subtract one from the starting argument value. Two regular expressions are constructed: one will match all

LISTING 2: Several string manipulation routines can be provided by appropriate use of the expr utility. Here's a handy shell wrapper to provide shell-level access to these routines.

A. Listing of the **string** *shell program:*

```
:
# @(#) string  Shell-level string routines
# Author: Peter Lacey, October 1990
#set -x # Uncomment for debugging
Program=`basename $0`   # This script's basename
# Display message when terminated by signal:
trap 'echo "$Program aborted"; exit 2' 1 2 3 15
# Define Correct usage message:
Usage="
\n$Program -n string ...\t\t(retrieve length of string)
\n$Program -l N string ...\t\t(get lefthand N characters of string)
\n$Program -r N string ...\t\t(get righthand N characters of string)
\n$Program -s N1 N2 string ...\t(get N2 characters starting at N1)"
# Define substring error message string
Error1="Left parameter for -s option is greater than string length."
#
#Function to display error message string and abort
errexit() {
    echo "Usage: $*" >&2
    exit 1
}
#
#Function to test if argument is an integer:
testint() {
    Int=$1
    expr $Int + 0 >/dev/null 2>&1
    [ $? -ne 0 ] && { echo "$Int not an integer" >&2; return 1; }
    return 0
}

# Function to generate dots for use in regular expressions
makedots() {
    Counter=$1
    while [ $Counter -gt 0 ]
    do
        echo ".\c"  # Use echo -n "." for BSD and SunOS
        Counter=`expr $Counter - 1`
    done
}

# Function to return length of string argument:
strlen() {
    [ $# -gt 0 ] || errexit $Usage
    String=$*
    expr "$String" : '.*'
}

# Function to return righthand N characters of string.
getright() {
    [ $# -gt 1 ] || errexit $Usage
    ReturnCnt=$1    # Number of characters to return
    testint $ReturnCnt || errexit $Usage    # Not integer
    shift
    String=$*       # String remains as argument
    StringLen=`strlen $String`
    ExcludeCnt=`expr $StringLen - $ReturnCnt`
    Dots=`makedots $ExcludeCnt`
    expr "$String" : "${Dots}\\(.*\\)"
}

# Function to return lefthand N characters of string.
getleft() {
    [ $# -gt 1 ] || errexit $Usage
    ReturnCnt=$1    # Number of characters to return
    testint $ReturnCnt || errexit $Usage    # Not integer
    shift
    String=$*       # String remains as argument
    StringLen=`strlen "$String"`
    [ $ReturnCnt -gt $StringLen ] && ReturnCnt=$StringLen
    Dots=`makedots $ReturnCnt`
    expr "$String" : "\\(${Dots}\\)"
}

```

continued

Looking for the best troff?

- Image Network brings you the traditional UNIX® typesetting and publishing tools—troff, nroff, tbl, eqn, all macros, Documenter's Workbench II ...
- Full graphics, from pic and grap to scanned images.
- Prints on all laser printers: Hewlett-Packard, Xerox, Dataproducts, PostScript, Imagen, QMS, Talaris, AT&T. Inkjet and typesetters, too.
- Quality fonts: Xroff ships with 18 typefaces in 4 to 48 point, and we provide hundreds more faces, in *any* size; all print on *all* our printers.
- Available for all UNIX operating systems, and VMS and MS-DOS.
- Our software has printed Unix manuals, papers, letters, proposals, and other documents for eight years at hundreds of major Unix sites from Berkeley to DEC to Apple to Bell Labs.

We call it

X™ ROFF

Extras with Xroff

X™ PAGE **Xpage** is our WYSIWYG previewer for pages on a screen with Xwindows. You see your words and drawings on your screen, each within a dot of where it will be placed on your paper.

X™ TC If you write or maintain software, **xtc** (xroff the C program) may become your favorite **xroff** tool. It will typeset source code written in C and other languages.

X™ PR Often you'd like to print off a simple file (a mail message or a tar trace) but you don't want to bother with putting in troff commands. Just use **xpr**. It wraps simple formatting commands around your file and **xroff**s it.

X™ LETTER **Xletter** makes it easy and fun to write business or personal letters. Just fill in the blanks in the template—you get a stunning letter every time.

X™ FAX **Xfax** is available now for some platforms. Use any fax machine in the world as your printer—or scanner.

Call now for your free evaluation copy!

image network
WHAT THE EYE CAN SEE, WE CAN COMMUNICATE.

140 S. Whisman Road, Mountain View, CA 94041

call 800-TO-XROFF
or (415) 967-0542
or fax (415) 967-0543

CIRCLE NO. 148 ON INQUIRY CARD

UNIX is a registered trademark of UNIX Systems Laboratories, Inc.

characters up to, but not including, the starting value; the other will match all the characters to return. If the length of the combined regular expressions exceeds that of the the string, the function will return all characters not matched by the first regular expression, otherwise it returns only the characters matched by the second.

Peter Lacey
Trigen Energy Corp.
White Plains, N.Y.

The Security Hole

Because security is becoming more and more important to computer users and administrators, we are providing a minisection of this column devoted to UNIX system security contributions. Please look over the security tools on your system and see if you have any that would meet or could be changed to meet our publication guidelines.

Recorded History

Dear Dr. Thomas:

Sometimes we need to monitor the commands that a new UNIX user employs while logged in to our system.Whereas the C and Korn shell have built-in logging of command history, the Bourne shell does not. I've written a Bourne shell script that provides the logging function. This code was created and tested on a Unisys 5000/50 minicomputer that runs UNIX SVR2.

[*Doctor's note:* Listing 3 depicts the **cmdlogger** script that you would use as the start-up, or log-in, program for an account you wished to monitor. However, the **eval** command prevents the user from entering incomplete command lines. All interactive commands must be entered on the same line before the newline. *Caution:* A knowledgeable user could easily "break out" of the program; however, it serves its purpose for users who aren't adept at system cracking.]

The command history log is written to a file named with the date of the action which is located in a directory named after the user's log-in account, the parent directory of which is defined by the **Logpath** variable. The first trap command ensures that a logout entry is made upon script exit and the second trap performs a continue command in the while loop if the user tries to exit with a keyboard-generated interrupt or quit signal.

The while command is controlled by the two loop-control commands–**echo**, which displays a prompt, and **read**, which collects the user's response. If the user responds with an end-of-file command (control-D) or "exit," the read command returns false so that the loop terminates and the user is logged out. If the last line is used, the **kill** command specifies that a SIGHUP signal be sent to all processes in the current process group, most notably the log-in shell, so the user is logged out.

The user's command line is "expanded" by **eval** (parameter substitution is done) and sent to the standard output by **echo**. The **set** command places the standard output in positional parameters. The first parameter (**$1**) always contains "eval" so it's shifted out of the way. Each remaining parameter is checked for the pattern "*cmdlogger*", the log file path, "*sh*", and "*su*". If detected, the specified command is ignored. This step provides a minimal

Listing 2 continued

```
 74  # Function to return N2 characters of string starting at N1
 75  substr() {
 76      [ $# -gt 2 ] || errexit $Usage
 77      Start=$1            # starting location
 78      ReturnCnt=$2        # return count
 79      testint $Start || errexit $Usage
 80      testint $ReturnCnt  || errexit $Usage
 81      shift; shift
 82      String=$*
 83      [ $Start -gt `strlen "$String"` ] && errexit $Error1
 84      Start=`expr $Start - 1`
 85      Dots1=`makedots $Start`
 86      Dots2=`makedots $ReturnCnt`
 87      if [ `strlen "${Dots1}${Dots2}"` -gt `strlen "$String"` ]; then
 88          expr "$String" : "${Dots1}\\(.*\\)"
 89      else
 90          expr "$String" : "${Dots1}\\(${Dots2}\\)"
 91      fi
 92  }
 93  # Main program starts here:
 94  # Process command line options:
 95  if [ "$OPTIND" = 1 ]; then  # use getopts to check option letters
 96      getopts lrsn optletter
 97      case $optletter in
 98          l)  function=getleft ;;
 99          r)  function=getright ;;
100          s)  function=substr ;;
101          n)  function=strlen ;;
102          \?) errexit $Usage ;;
103      esac
104      shift `expr $OPTIND - 1`    # shift away option letter
105  else    # Can't use getopts
106      case $1 in
107          -l) function=getleft; shift ;;
108          -r) function=getright; shift ;;
109          -s) function=substr; shift ;;
110          -n) function=strlen; shift ;;
111          -?) echo "Unrecognized option: $1"; errexit $Usage ;;
112      esac
113  fi
114      case $# in
115          0)  errexit $Usage ;;           # No arguments specified
116          *)  [ -z "$function" ] && errexit $Usage  # no option used
117              eval $function $* ;;        # evaluate the function
118      esac

B. Some sample usage examples:

$ string -n UNIX for the masses
19
$ string -l 8 UNIX for the masses
UNIX for
$ string -r 8 UNIX for the masses
e masses
$ string -s 8 5 UNIX for the masses
r the
$ string -s 17 10 UNIX for the masses
ses
$
```

LISTING 3: You can design a custom account start-up program to restrict a user's activities that logs all command lines entered by a user and executes "safe" commands.

```
:
# @(#) cmdlogger  Monitor user activity
# Author: Rene N. Mount, January 1989
# set -x    # Uncomment for debugging
Auditor=root    # auditor for users
Logname=`logname`   # Get log-in name
if [ $? -ne 0 ]; then
    echo "Can't get user's log-in name" ¦
    mailx -s "Command line auditing" $Auditor
    exit 1
fi
Logpath=/usr/acct/lld   # Directory for command history log
today=`date +%m%d`  # Get month and day numbers
Logfile=$Logpath/$Logname/log$today
trap 'echo "$Logname logout: `date`" >>$Logfile' 0
trap 'continue' 2 3
Prompt="Cmdlogger# "        # Use standard Bourne shell prompt
echo "$Logname  login: `date` " >>$Logfile
if [ $? -ne 0 ]; then
    MSG="$Logname can't log on because can't create log file"
    exit 2
else
    MSG="$Logname Logged on ..."
    chmod 200 $Logfile  # Not readable by owner
fi
echo $MSG ¦ mailx -s "Command line auditing" $Auditor
```

continued

level of security so the user cannot read or manipulate the **cmdlogger** script, access the logfile, run a subshell, or use **su** to switch to another user.

Rene N. Mount
U.S. West Communications
Albuquerque, N.M.

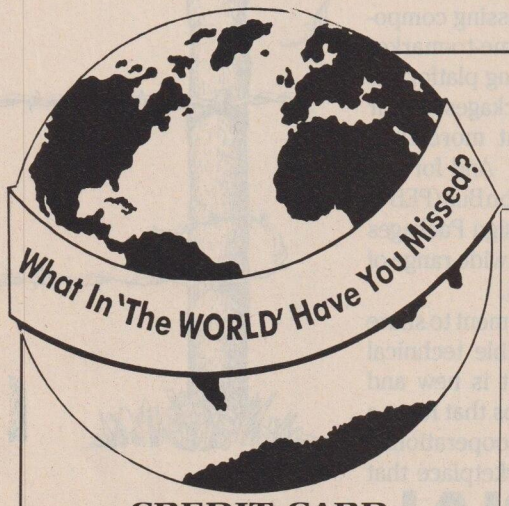
Wanted: C Version of Combined chkfiles/fixfiles Program

Here's a small challenge for our C programming enthusiasts: submit a C program that combines the functionality of **chkfiles** and **fixfiles** (see Listings 3D and 3E in my April 1991 column). The program should follow the guidelines published at the end of this column. However, I'm willing to relax the 100-line length restriction and allow up to 200 source lines. But, "smaller is more beautiful."

Guidelines for Submissions

Mail shell scripts, C programs, or tips to ease the burden of system administrators, programmers, and users to: "Wizard's Grabbag," *UNIXWORLD*, 444 Castro St., Mountain View, CA 94041. Or submit via UUCP e-mail to:

continued



CREDIT CARD CHARGE ORDERS

by PHONE 415-940-1500

or

REQUEST OUR CUMULATIVE INDEX LISTING ARTICLES IN 1984–1990 ISSUES

UNIXWORLD BACK ISSUES

Single Copies or **SAVE 40%** on Complete Sets

Send Coupon with Payment to:

Back Issues
UNIXWORLD Magazine
444 Castro Street
Mountain View, CA 94041

Prepayment is required on all orders.

☐ **Check Enclosed**
(Payments from foreign countries must be in U.S. funds payable at a U.S. bank.)
☐ **VISA** ☐ **Master Card** ☐ **American Express**

Card # _____ Exp. _____

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

U.S. POSTAGE: Please add $2.50 per single copy. For Volume I add $4.00. Include $6.00 additional postage for each subsequent volume set.

FOREIGN POSTAGE: Please add $4.50 per single copy. For Volume I add $8.00. Include $10.00 additional postage for each subsequent volume set.

Complete Sets: Please enter your choice.

Quantity		*Amount*
	1984, Volume I	
_____	Nos. 1-7 @ $25.00 =	_____
	1985, Volume II	
_____	Nos. 2-12 @ $40.00 =	_____
	1986, Volume III	
_____	Nos. 1-12 @ $44.00 =	_____
	1987, Volume IV	
_____	Nos. 1-12 @ $44.00 =	_____
	1988, Volume V	
_____	Nos. 1-12 @ $44.00 =	_____
	1989, Volume VI	
_____	Nos. 1-12 @ $44.00 =	_____
	1990, Volume VII	
_____	Nos. 1-12 @ $44.00 =	_____
_____	All 7 sets @ $285.00	_____

Single Issue Orders

Quantity		Issue Nos.
_____	Vol. I, Nos. 1-7	_____
_____	Vol. II, Nos. 2-12	_____
_____	Vol. III, Nos. 1-12	_____
_____	Vol. IV, Nos. 1-12	_____
_____	Vol. V, Nos. 1-12	_____
_____	Vol. VI, Nos. 1-12	_____
_____	Vol. VII, Nos. 1-12	_____

Total Qty.		Amount
_____	Single Issue(s) @ $6.00	_____
	Subtotal $	_____
	Postage & Handling	_____
	CA Residents add 7% tax $	_____
	TOTAL $	_____

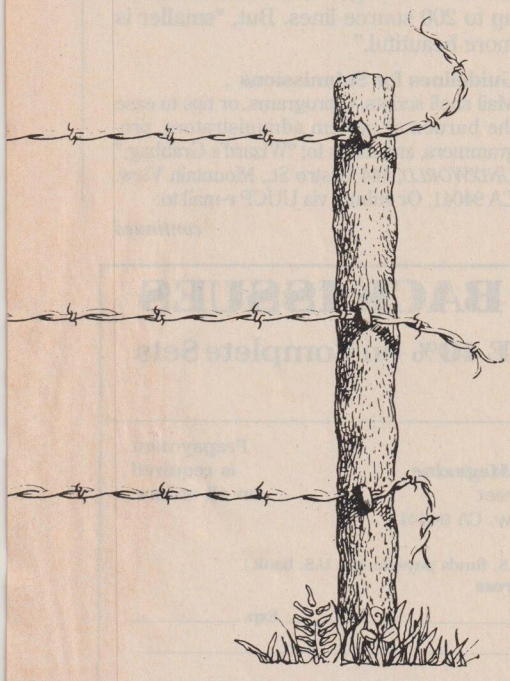
No Barriers.

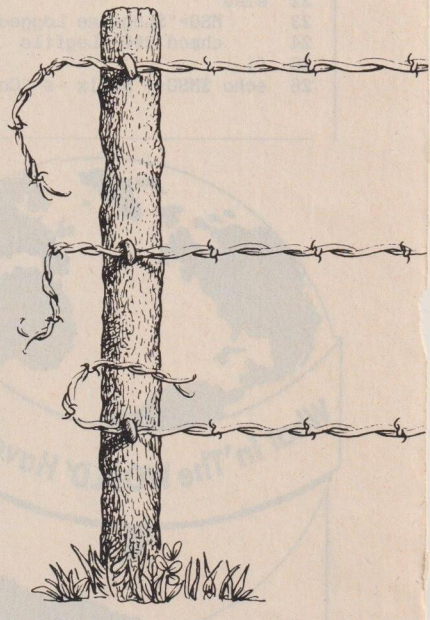
Dialogic, the call-processing industry's de facto standard, announces a new working alliance with systems developers, customers, and competitors to make our industry flourish.

We call it the Open Development Program.™

OPEN™ is designed to embrace the huge potential of a marketplace driven by a common standard. It is a strategy to stimulate technology sharing, cooperation, and dramatic growth.

Specifically, OPEN gives developers much greater access to the products that are the call-processing de facto standard. With OPEN, you can receive documentation to the basic Dialogic building blocks. OPEN enables you to design hardware and software that's compatible with Dialogic architecture — and do so intelligently and economically.





The benefits of OPEN will be substantial: a choice of both Dialogic and non-Dialogic call-processing components, shortened development and time-to-market periods, and more versatile call-processing platforms.

At the core of OPEN are the Design Packages for our analog expansion bus, which represent more than 400,000 voice-processing ports installed. And for our high-density digital platform, PCM Expansion Bus (PEB™) — basis for more than 40,000 ports. Design Packages include everything you need to develop a wide range of hardware modules for Dialogic platforms.

What is OPEN? • It is Dialogic's commitment to share vital information. • It is the considerable technical resources of Dialogic at your side. • It is new and revitalized strategic business relationships that forge a community of vigorous competition and cooperation. • Finally, OPEN is a healthy, dynamic marketplace that welcomes new ideas, encourages new technologies, and spurs long-term growth.

There are no barriers. Just a whole new world of opportunity. To learn more about Dialogic's Open Development Program, please call (201) 334-8450.

DIALOGIC®

THE NAME BEHIND THE VOICE

Dialogic Corporation
300 Littleton Road, Parsippany, NJ 07054
(201) 334-8450 Fax: (201) 334-1257

CIRCLE NO. 119 ON INQUIRY CARD

Listing 3 continued

```
while
    echo "$Prompt\c"    # Display prompt
    read command        # Store user response
do
    doit=True       # Set flag to run all commands
    if [ -n "$command" ]; then  # If there's input
        set `echo eval $command` # Substitute parameters
        shift   # remove $1, which contains eval
        echo "$*" >>$Logfile # log expanded command line
        for instring in $*; do  # check each element
            case "$instring" in
                *cmdlogger*) # can't touch this file
                    doit=False ;;
                $Logpath*)  # can't access log file
                    doit=False ;;
                *sh*)   # don't run a subshell
                    doit=False ;;
                *su*)   # not allowed to switch user
                    doit=False ;;
            esac
        done
        [ $doit = True ] && eval $command # Run it
    fi
done
# Uncomment next line if place this script within .profile:
#kill -1 0  # terminate log-in shell when leave while loop
```

uunet!uworld!grabbag
or use the domain address:
grabbag@uworld.com

Please provide your full name and surface mailing address and, if you use e-mail, your return mail-routing address (from **sun** or **uunet**) as well.

Briefly describe the hardware and software environment (especially the UNIX system version) on which the contributed code was run.

If possible, you should write code that is portable across the popular versions of the UNIX system (System V.X, BSD 4.X, XENIX). Write Bourne or Korn (but not C) shell scripts and use universally available utilities, for example, **who am i** (all systems) instead of **whoami** (Berkeley only). If feasible, use **getopts(1)** or **getopt(3C)** as appropriate to process command-line options and their arguments.

Use the standard I/O library for structured modular C code. Check source code for non-portable constructions with **lint**. Eliminate hardware dependencies, such as terminal control sequences. (Use **termcap** or **terminfo**.) Isolate non-portable code to one region or a separate module. Keep examples compact (under 150 lines of code with each line less than 65 characters long–counting tabs as 4 spaces) and explanations concise (under 400 words). Use **sed** instead of **ed** scripts, pipelines instead of intermediate temporary files, etc. Be succinct!

If you submit a contribution to Wizard's Grabbag, we understand that you accept the following conditions:

You grant McGraw-Hill, Inc. the non-exclusive right to publish and distribute your contribution worldwide, in any medium and in all languages. We reserve the right to edit your contribution and publish it at any time.

If we publish your contribution, we will send you $50 within 60 days after publication. However, we require social security numbers from U.S. citizens.

We will acknowledge receipt of contributions, circumstance permitting. We will accept no responsibility for loss or damage to contributions. Printed submissions should be copies.

Your submission must not violate or infringe any copyright or other propietary right of others, nor contain anything injurious.

We make no guarantees as to the materials published in Wizard's Grabbag. Any use of materials published in Wizard's Grabbag is at the sole risk of the user.

Getting Grabbag Electronically

UUNET Communication Services is now archiving our monthly Wizard's Grabbag listings. The source files have pathname **uunet!~/unix-world/grabbag/19*YY*/*monYY*.Z**, where *mon* is the first three letters of the month (**jan**, **feb**, and so forth) and *YY* is the last two numbers of the year (as in **89**). Use **compress -d** (16-bit) to unpack the archive. Now you can download even if you don't have an account on UUNET–call 1-900-GOT-SRCS and log into UUCP-access account **uucp** with no password. Callers will be charged 40 cents/minute connect time.

Current online listings are available via dial-up access from Reiter's Software BBS 604-576-1214 (300/1200/2400 baud), 604-576-6357 (USR HST 9600), or 604-576-6317 (9600/19200 baud Telebit TB+ PEP protocol). Use account name **uworld** and password **code4me**.

Regrettably, we do not have the resources to provide source listings by any other means. ■

Books That Help People Get More Out of Computers

The Z-Mail Handbook

By Hanna Nelson

Z-Mail is a new program for sending and reading mail that can be used on UNIX terminals or workstations, in line mode, ascii graphics mode or GUI mode. You may already be familiar with its basic command set, based on the widely-used Mush (Mail User's Shell). Z-Mail also supports multimedia attachments, so you can mail text, graphics, voice, desktop publishing documents, spreadsheets—anything you can store on disk. The complete guide to this powerful mail program. Also covers Mush.
~380 pages, June 1991, $29.95

Practical UNIX Security

By Simson Garfinkel & Gene Spafford

Tells system administrators how to make their UNIX system as secure as it possibly can be, without going to trusted system technology. This guide describes the issues, approaches, and methods for implementing security measures—spelling out what the varying approaches cost and require in the way of equipment. Covers Berkeley UNIX as well as System V.
~475 pages, June 1991, $29.95

Typesetting Tables on the UNIX System

By Henry McGilton & Mary McNabb

For those UNIX users who depend on *troff*, the definitive guide to *tbl*. If you're a novice UNIX user, this book is the best way to learn *tbl*. If you're an expert, the book will pay for itself the first time you want to show off.
280 pages, $24.95

A16B
B1GI

Usenix booth #403
Xhibition booth #1310

For a free catalog of titles, write or call:

O'Reilly & Associates, Inc.

632 Petaluma Ave. • Sebastopol, CA 95472
(800) 338-6887 • (707) 829-0515

CIRCLE NO. 142 ON INQUIRY CARD

The joy of C-scape

Elegant graphics and text

The C-scape™ Interface Management System is a flexible library of C functions for data entry and validation, menus, text editing, context-sensitive help, and windowing. C-scape's powerful Look & Feel™ Screen Designer lets you create full-featured screens and automatically generates complete C source code.

C-scape includes easily modifiable high-level functions as well as primitives to construct new functions. Its object-oriented design helps you build more functional, more flexible, more portable, and more unique applications—and you'll have more fun doing it.

The industry standout. Many thousands of software developers worldwide have turned to the pleasure of C-scape. The press agrees: "C-scape is by far the best. . . . A joy to use," wrote IEEE *Computer*. Major companies have selected C-scape as a standard for software development.

C-scape's open architecture lets you use it with data base, graphics, or other C and C++ libraries. C-scape runs in text or graphics mode, so you can display text and graphics simultaneously. To port from DOS or OS/2 to UNIX, AIX, QNX, or VMS, just recompile. C-scape also supports Phar Lap and Rational DOS extenders.

Graphics. Run in color in text or graphics mode. Read images from PCX files.

Object-oriented architecture. Add custom features and create reusable code modules. C++ compatible.

Mouse support. Fully-integrated mouse support for menu selections, data entry fields, and to move and resize windows.

Portability. Hardware independent code. Supports DOS, OS/2, UNIX, AIX, VMS, others. Autodetects Hercules, CGA, EGA, VGA. Supports Phar Lap and Rational DOS extenders.

Text editing. Text editors with word wrap, block commands, and search and replace.

Field flexibility. Masked, protected, marked, required, no-echo, and named fields with complete data validation. Time, date, money, pop-up list, and many more higher-level functions; create your own.

Windows. Pop-up, tiled, bordered and exploding windows; size and numbers limited only by RAM.

Menus. Pop-up, pull-down, 123-style, or slug menus; create your own.

Context-sensitive help. Link help messages to individual screens or fields. Cross reference messages to create hypertext-like help.

Code generation. Build any type of screen or form with the Look & Feel™ Screen Designer, test it, then automatically convert it to C code.

Screen flexibility. Call screens from files at run time or link them in. Automatic vertical/horizontal scrolling.

International support. Offices in Berlin, Germany, with an international network of technical companies providing local training, support and consulting.

Trial with a smile. C-scape is powerful, flexible, portable, and easy to try. Test C-scape for 30 days. It offers a thorough manual and function reference, sample programs with source code, and an optional screen designer and source code generator. Oakland provides access to a 24-hour BBS, telephone services, and an international network of companies providing in-country support. No royalties, runtime licenses, runtime modules. After you register, you get complete library source code at no extra cost.

Call 800-233-3733 (617-491-7311 in Massachusetts, 206-746-8767 in Washington; see below for International). After the joy of C-scape, programming will never be the same.

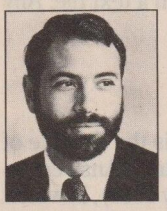
DOS, OS/2 (Borland and Microsoft support): with Look & Feel, $499; library only, $399; UNIX, etc. start at $999; prices include library source. Training in Cambridge and Seattle each month. Mastercard and Visa accepted.

OAKLAND

Oakland Group, Inc. 675 Massachusetts Ave., Cambridge, MA 02139 USA. FAX: 617-868-4440. **Oakland Group, GmbH.** Alt Moabit 91-B, D-1000 Berlin 21, F.R.G. (030) 391 5045, FAX: (030) 393 4398. **Oakland International Technical Network** (training, support, consulting): **Australia** Noble Systems (02) 564-1200; **Benelux** TM Data (02159) 46814; **Denmark** Ravenholm (042) 887249; **Austria-Germany-Switzerland** ESM 07127/5244; **Norway** Ravenholm (02) 448855; **Sweden** Linsoft (013) 111588; **U.K.** Systemstar (0992) 500919. Photo by Jessica A. Boyatt; Kanji by Kaji Aso. Picture shows a C-scape program combining data entry with video images loaded from PCX files. C-scape and Look & Feel are trademarks of Oakland Group, Inc.; other trademarks belong to their respective companies. Copyright © 1990, by Oakland Group, Inc. Features, prices, and terms subject to change.

CIRCLE NO. 177 ON INQUIRY CARD

Ray Swartz



STARTING SCRIPTS, ADDING RETURNS, SHELL DEBUGGING

Steve Giampa wonders why the shell scripts published in *UNIXWORLD* start with a colon. My answer describes the C shell's need for a Bourne/C shell flag. Thom Vinder is looking for a way to append carriage returns to lines of a text file. I provide two solutions: a one-line **awk** command and a short C program. Marianne Walters asks for help in debugging her shell scripts. I discuss several options for all three shells that might be of use.

Something That Does Nothing

Question: I am curious about a convention used in the shell scripts published in your magazine–all shell scripts start with a colon on a line by itself. I know that the colon is a "do nothing" operator that returns a zero exit code. What is the purpose of this line of code in your shell scripts?

Steve Giampa
Waltham, Mass.

Answer: As you are probably aware, there are several command processing shells available for the UNIX system. The three most common are the Bourne, C, and Korn shells. The Bourne shell is supplied with all UNIX versions and most UNIX systems also make the C shell available. Fewer, notably System V Release 4, give users a choice of all three shells.

When more than one shell is available, users might be invoking scripts from different shells. Neither the Bourne nor Korn shell can execute C shell commands. However, the C shell was designed to handle Bourne (and, by extension, many Korn) shell scripts. As a result, there must be an unambiguous way to identify the language of a script file before it can be processed.

To achieve its flexibility, the C shell defines a "binary" flag. If the first character in the script is a # (herein called an octothorpe), the parent C shell invokes another C shell to interpret the script file. Otherwise, a Bourne shell is invoked to handle the script by default.

This behavior presents a problem with an elegant solution. In addition to being the C shell's flag, the octothorpe is also a comment marker for all three shells. It is good programming style to begin a script with a comment header that includes the name of the script; a brief description of what it does; and its author, date of creation, and revision level. In a multishell environment, this practice could could easily cause an error as a Bourne/Korn script comment delimiter would erroneously tell the C shell to use another C shell to run a script that is not written in the C shell language.

However, you can invoke a Bourne or Korn shell script that starts with a comment without making the first character in the file an octothorpe by using one or more spaces, tabs, or newlines. However, at *UNIXWORLD*, we prefer to use a colon, which is a "do nothing" operator. This approach maintains the format of the file without extraneous whitespace and allows you to start a script with a comment header.

Another approach is to start shell scripts with a **#!** followed by the path name of the shell to run the script. For example, a Bourne shell script would start with **#!/bin/sh**. The **#!** notation is hard-wired into the **exec()** system call, which executes commands. If **exec()** sees **#!** as the first two characters in a file, it uses the command listed after the **#!** to interpret the file's contents. The **#!** notation doesn't work on systems with versions of the kernel that don't support this feature.

Another character combination that we add to our scripts is the @(#) character sequence in the comment line that identifies the script program. The Source Code Control System (SCCS) **what(1)** command searches a file for a line containing this four-character sequence. If located, **what** sends the rest of the line up to the first greater-than sign (>), newline, backslash (\), or null character to its standard output.

The @(#) sequence, often called the "what string," can be compiled into a program to provide an identification line. In C programs, a variable is initialized with a string containing this sequence (see Listing 1A). Furthermore, if you are using SCCS, you can initialize the variable with the %Z% macro, which **get(1)** converts to the "what string."

continued

LISTING 1: You can add identification information to an executable file and use the SCCS `what` command to display it.

A. Defining an SCCSID variable to hold the "what string":

```
char SCCSID[] = "@(#) identifying information";

main(argc, argv)
int argc;
char *argv[];
{
    ...
```

B. The "what strings" displayed by my SunOS 4.0.3 **ls** *command:*

```
$ what /usr/bin/ls
/usr/bin/ls
        ls.c 1.5 88/02/07 SMI
        reset_sh.c 1.3 88/02/07 SMI
        setupterm.c 1.13 88/02/07 SMI
        termerr.c 1.4 88/02/07 SMI
$
```

LISTING 2: You can add a carriage return to the end of all the lines in a text file with a shell-level tool or a C program. We provide both solutions here.

A. The one-line interactive **awk** *solution:*

```
$ awk '{printf "%s\r\n", $0}' filename
```

B. The **insertm** *C program can handle lines of any length:*

```
 1  /*
 2   * insertm.c - put carriage returns before every newline in a file
 3   */
 4  #include <stdio.h>
 5  char SCCSID[] = "@(#) insertm.c 1.1 Ray Swartz 2/10/91";
 6
 7  main(argc, argv)
 8  int argc; char *argv[];
 9  {
10      char    *prog = argv[0];    /* name of this program */
11      char    *fgets();           /* get line from input stream */
12      char    instr[BUFSIZ + 1];  /* input line buffer */
13      int     len;                /* length of input line */
14      FILE    *fpin, *fopen();    /* for stream I/O */
15
```

continued

Most UNIX system commands contain "what strings." Listing 1B shows the strings compiled into the **ls** command on a Sun-3/60 running 4.0.3 SunOS. Because some of the scripts we publish may end up in a system's executable directory, it is good style to include a "what string" comment in our code.

The Rest of the Story

Question: I need to add a carriage return to the end of each line in a text file. Any ideas?

Thom Vinder
Santa Fe, N.M.

Answer: Your question is the flip-side of one I received in the first "Answers to UNIX" column (January 1989), in which someone asked how to remove control-Ms from a file copied from a DOS floppy.

For simple text files, you can use a one-line **awk** program. A carriage return is represented by the **\r** escape sequence in strings. To add a carriage return to each line, use the **awk** statement **printf "%s\r\n", $0**, where **$0** represents the current input line. This **printf** command prints each line read, adding both a carriage return and newline at the end. The actual command is shown in Listing 2A.

The **awk** solution only works for "normal" text files because if the input line is too long, **awk** performs a core dump. To

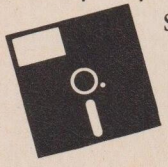
"Parlez-vous Q-TEL™?"

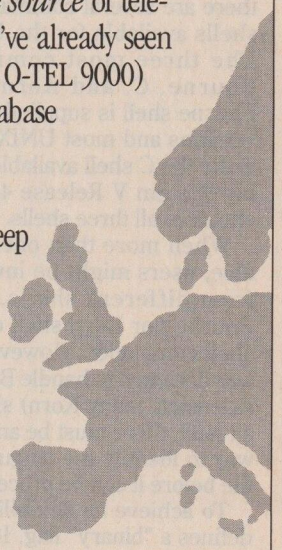
Oui...Si...Ja...now the answer is Yes *wherever* you go internationally–thanks to our *new* Q-TEL International Database.

Q-TEL speaks everyone's language when you're talking about *one single source* of telecommunications rate, tariff and regulatory information. Domestically, you've already seen how our Q-TEL Databases (Q-TEL 1000, Q-TEL 5000 Plus, Q-TEL 7000 and Q-TEL 9000) can define a better bottom line for you. Now watch how the newest Q-TEL database translates into maximum cost savings for you internationally.

All our Q-TEL products have superior performance packaging, adapting easily to your applications with the most current and accurate rate, tariff and regulatory information to keep you updated and on top of industry activity.

So why not parlay our advanced telecommunications capabilities into a unique profit opportunity for you. Remember, whatever your role in telecommunications–manufacturer, seller, user of equipment or services–you also get our 20 years of telecommunications experience, backed by the information network of McGraw-Hill. Parlez with us today...Call: 1-800-526-5307 ext.: 290





CCMI *First–Rate Information*

Come visit us at the upcoming 1990 ICA Trade Show–Booth 1346. Let's talk Q-TEL and more.

McGraw-Hill

handle files with longer lines requires a custom C program for which I wrote **insertm** (see Listing 2B). The program reads lines up to a newline or BUFSIZ number of characters. The program reads the standard input unless a file name is supplied as an argument, in which case, that file is used. As written, **insertm** only handles a single file name argument.

If a newline is encountered in input, a carriage return is inserted before it. Otherwise, nothing is added. In either case, the completed line is then printed to the standard output.

Reading Between the Lines

Question: I find the syntax error messages printed by the shell to be cryptic and not particularly informative. Are there some debugging tools that I can use to make it easier to find errors in my shell scripts?

Marianne Walters
Pensacola, Fla.

Answer: In general, the Bourne, Korn, and C shells offer the same debugging capabilities. The help comes in the form of options that change how the shell executes commands. However, depending on the shell being used, one of the options performs with a slight variation.

continued

Listing 2 continued

```
16      if (argc > 2) { /* more than one cmdline arg specified */
17          fprintf(stderr, "Usage: %s [input file]\n", prog);
18          exit(1);
19      } else if (argc == 1)  /* if no file arguments, */
20          fpin = stdin;    /* use standard input */
21      else {  /* otherwise use argument as file name */
22          if ((fpin = fopen(*++argv, "r")) == NULL) {
23              fprintf(stderr, "%s, Can't open %s\n", prog, *argv);
24              exit(2);
25          }
26      }
27      while (fgets(instr, BUFSIZ, fpin) != NULL) { /* read a line */
28          len = strlen(instr);          /* length of line */
29          if (instr[len - 1] == '\n') { /* is last char a newline? */
30              instr[len - 1] = '\r';    /* if so, replace with return */
31              instr[len] = '\n';        /* then add newline and */
32              instr[len + 1] = '\0';    /* terminate string */
33          }   /* last character not newline, so don't add return */
34          fprintf(stdout, "%s", instr); /* print buffer */
35      }
36      fclose(fpin);
37      exit(0);
38  }
```


ANNOUNCING:
AN ADVANCE IN 9-TRACK OF VERY SMALL PROPORTIONS.

While everyone else is downsizing and simplifying computers and peripherals, 9-track manufacturers have somehow managed to buck this trend with tape drives that are huge and heavy or awkwardly manual loading.

Too bad for them. Introducing the OD3210, designed and built by Overland Data to bring 9-track into the modern office. It's incredibly compact. Whisper quiet. Uses only 45 watts. And it's extremely reliable. No other drive has fewer moving parts. Best of all, it's surprisingly affordable.

The OD3210 comes with a two year warranty, expert toll-free support, and the ODI Special Service Program. It also runs under UNIX®. So call us. And find out why some of the best advances are the smallest ones.

1-800-PC9-TRAK
(1-800-729-8725)
Bus. Phone: 1-619-571-5555 • FAX: 1-619-571-0982

UNIX is a registered trademark of AT&T.

OVERLAND DATA
San Diego, CA

CIRCLE NO. 150 ON INQUIRY CARD

THE NEW COMPUTER REVOLUTION:
UNIX+DOS

A Sun/SPARC compatible workstation that brings you the best of both worlds

Introducing a revolutionary workstation that harnesses the power of a 25 Mhz SPARC™ chipset to a personal computer. The Series 2000 by Orange Systems. Now you can get uncompromised, sophisticated SPARC performance from a workstation that's equally competent to run your accounting programs and concurrently write your business letters.

SPARC COMPLIANT

With the Series 2000 SPARC workstation on a PC base, users are discovering options they've never had before. Imagine...

- ▲ 100% Sun binary compatible
- ▲ Innovative gateway between DOS and UNIX®
- ▲ 100% usage of PC/AT peripherals
- ▲ SPARC workstation plus PC/AT™ mother board with 4 ISA slots
- ▲ 100% VGA DOS compatibility with on board 386/25 Mhz processor–387 math co-processor

Prices starting at $6995.

All the benefits of RISC and UNIX plus the low-cost, high volume technology of DOS personal computing. Series 2000. An idea whose time has come.

ORANGE SYSTEMS

13 Firstfield Road,
Gaithersburg, Maryland 20878
Phone: (301) 840-2220
Fax:301-977-5362

SPARCstation and SunOS are trademarks of Sun Microsystems, Inc. Sun Microsystems is a registered trademark of Sun Microsystems, Inc. UNIX is a registered trademark of AT&T. SPARC and SparcOS are trademarks of SPARC International.

CIRCLE NO. 201 ON INQUIRY CARD

Georgia Tech

College of Computing
Continuing Education

Certificate Programs

- **Networking**
- **UNIX®**
- **Software Engineering**

Networking Certificate Courses

Intro. to Network Arch. & OSI
X.25 and Packet Switching
Local and Metropolitan Area Networks
OSI Network Management
IBM's Systems Network Architecture
Advanced Packet Switching
OSI Upper Layers
Legal Issues in Telecommunications

UNIX Certificate Courses

UNIX for Users
UNIX Shell Programming
UNIX System Administration
UNIX Tools
UNIX Connectivity Workshop
UNIX Networking
Intro C
Intermediate C
UNIX System Calls
UNIX Internals
X-Windows
C++

Software Engineering Certificate Courses

Introduction to Software Engineering
CASE
Object Oriented Design
Ada: A Manager's Introduction
Ada: A Developer's Introduction
Ada: Real-Time Programming
DoD Software Engineering
Electronic Warfare Software Principles
Designing User Interfaces
User Interface Program. with X11 Window Systems

For more information contact
Georgia Institute of Technology
Continuing Education
1-800-325-5007
(404) 894-2547
FAX (404) 853-0117
rice@cc.gatech.edu
UNIX is a registered trademark of UNIX System Laboratories, Inc.

LISTING 3: The Bourne, C, and Korn shells all provide limited support for debugging shell scripts.

A. Using the **-u** *option:*

```
$ cat u.test
a=1
echo $a
echo $b    # b is unset
$ sh -u u.test
1
u.test: b: parameter not set
$
```

B. The Korn shell ERR trap is used to print a message if **grep** *can't find a pattern:*

```
$ cat err.test
trap 'echo $1 not found in $2' ERR
grep "$1" $2
$ err.test lkasdklj err.test
lkasdklj not found in err.test
$
```

*C. The Korn shell supplies a debugging prompt (*PS4*) that is displayed when* **-x** *is set:*

```
$ cat ps4.test
PS4='($LINENO) '
set -x
a=1
echo $a
$ ps4.test
(3) a=1
(4) echo 1
1
$
```

Each of the three shells will read commands in a file without executing them and notify you if it finds a syntax error. To do this, use the **-n** option and supply the script name as an argument to the appropriate shell. For example, to check the syntax of a file named **testscript**, you would run **sh -n testscript**. You also could use **csh** or **ksh**, depending on your scripting language. In a certain sense, the **-n** option is like a **lint** command for shell scripts.

The other two debugging options perform the same function, but at different stages. The **-v** option and the **-x** option print out commands as they are executed by the shell. The **-v**, or verbose, option prints the line as it is read, but before any shell metacharacters have been interpreted. The **-x**, or echo, option prints lines as they are executed after the metacharacters have been interpreted.

The **-v** and **-x** combination is good for checking what the shell did to each command line. An error is often caused when the shell changes a line in a different way than you intended. To run **testscript** with both of these options set, use **sh -xv testscript**.

Because of the C shell's history feature, the **-v** option does not list a C shell command line as it is read, but instead prints every line after any history substitutions, but before any other metacharacters are interpreted. In addition, the C shell offers the **-V** and **-X** options. These uppercase variants take effect before the contents of the **$home/.cshrc** file are interpreted. Their lowercase relatives kick in after **$home/.cshrc** is processed.

The C shell has its own start-up file–the **.cshrc** file in your home directory. This file is run whenever a C shell is executed. Every time you execute a C shell script, a C shell must be created to run it. Before the script is executed, the newly created C shell interprets the contents of **$home/.cshrc**. The main reason for the **-V** and the **-X** options is to show you if any of the C shell start-up code is affecting your script. For instance, problems may be caused by aliases defined in **.cshrc**.

The Bourne and Korn shells recognize a **-u** option, which may help locate errors. This option tells the shells to print an error message and terminate the script if the user attempts to substitute an unset variable (see Listing 3A). The C shell does not offer a separate option to provide this functionality because it will inform you if a variable is undefined by default.

continued

THERE'S A TIME AND A PLACE FOR CONVENTIONAL THINKING.

(Then there's INTEROP 91)

For five years, the INTEROP Conference and Exhibition has been anything but conventional. We present all the new and relevant information, including the latest developments and most exciting directions in internetworking and network computing.

Which is why INTEROP 91 stands alone as a unique and practical arena for making informed network decisions in any complex, demanding I/S environment.

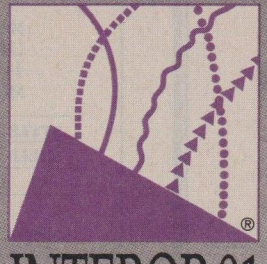
The INTEROP 91 program addresses the industry's most critical issues. Network Management. Security. Client-Server Computing. High-Speed Transport Options. LAN/WAN Interconnect. Distributed Data Bases, and much more.

You can choose from 45 Conference Sessions on emerging technology, internetworking strategies, multiplatform applications and other critical issues. All led by world renowned experts in the field — including Ellen Hancock, Richard Caruso, Nick Lippis, Scott Bradner, Dr. John McQuillan, and Dr. Douglas Comer. There will be 30 information packed, two-day Tutorials. And our highly acclaimed Executive INTEROP, which addresses the issues of concern to senior I/S managers.

On the Exhibition floor, your 250 most important vendors are connected to a functioning global internetwork. Each represented by knowledgeable people who can answer your toughest questions. So product demos mean hands-on, working sessions in a dynamic environment. And our exclusive Solutions Showcase™ Demonstrations focus on the latest technologies including SNMP, FDDI, Frame Relay, DCE, ONC, GOSIP/OSI, ISDN, and SMDS.

So if you have internetwork problems to solve, or growth to support, plan now to attend INTEROP 91. Because breakthrough ideas can only happen in an unconventional forum.

THE 6TH INTEROPERABILITY CONFERENCE & EXHIBITION OCTOBER 7-11 1991



INTEROP® 91

CALLTODAY FOR A FREE BROCHURE

1•800•INTEROP

"I KNOW IT WORKS, I SAW IT AT INTEROP!"

©1991 Interop, Inc. 480 San Antonio Road, Suite 100 Mountain View, CA 94040 1-800-468-3767 FAX 1-415-949-1779

CIRCLE NO. 66 ON INQUIRY CARD

If you have trouble with unwanted file name generation, all three shells have a way to suppress file name matching. For the Bourne and Korn shells specify the **-f** option. In the C shell set the **noglob** variable with **set noglob**.

All three shells recognize an **-e** option, which tells the shell to terminate if a command fails with a non-zero exit status. The Korn shell supports a special ERR trap condition that is sprung when a command fails. Listing 3B demonstrates an ERR trap that prints a "not found" message if **grep** can't locate a pattern in a file.

With Korn shells newer than the June 3, 1986 version, a special DEBUG trap condition is supported. This condition is like a normal signal catching condition except the action is executed after *each* script command is executed. This feature allows you to check files or do other processing to see how a script is progressing.

The newer Korn shell offers a special debugging prompt **PS4** that is printed whenever execution trace is enabled (**-x** option). By default, **PS4** is set to **+**. If you want to view the line numbers as execution is being traced, use the **LINENO** variable to store the number of the current line being executed (see Listing 3C).

You can set these options from the command line when you execute your script as well as turn them on and off throughout the script itself. In the Bourne shell, all options can be turned on within a script with the **set** *-option* syntax and turned off with the **set** *+option* command.

The Korn shell also allows you to turn options on and off within the script itself. In addition to using the **set** command and option letters, you can use option names. If you wish to use option names, set them with **set**'s **-o** option and unset them with the **+o** option. The option names are **errexit** (**-e**), **noexec** (**-n**), **noglob** (**-f**), **nounset** (**-u**), **verbose** (**-v**), and **xtrace** (**-x**).

The C shell doesn't provide as much flexibility in setting its options. Only the **noglob**, **echo**, and **verbose** options can be turned on and off from inside a script. Use **set** to enable them and **unset** to disable them.

Guidelines: Obviously, this column won't be of much interest unless you send us your questions. Try to make your questions as general interest as possible, and please no questions regarding specific hardware or third-party application packages. State the UNIX system version, if applicable, for the question at hand. Send your questions to Ray Swartz, "Answers to UNIX," c/o *UNIX WORLD* Magazine, 444 Castro St., Mountain View, CA 94041; fax them to 415-967-1257; or send UUCP-based e-mail to:
uunet!uworld!ans2unix
or the domain address:
ans2unix@uworld.com

Please include your surface mailing address and telephone number. ■

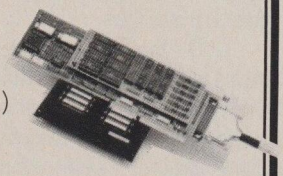
Ray Swartz is the founder of Berkeley Decision/Systems, which specializes in C and UNIX training. His first book discusses using C for business applications, and his second book teaches shell programming using business-related examples.

LET SPEEDBOARD SPEED UP YOUR UNIX/XENIX MULTIUSER SYSTEMS

SPEEDBOARD has everything everyone may have——————***Performance***

SPEEDBOARD has something everyone may never have ——***Price***

For ONLY $299,*
you have:



- 16MHz 80186 processor
- 128K RAM (256/512K opt.)
- 8/16 ports up to 64 users
- 50-38400 bps
- Modem supported each port
- Statistical supporting software

SO, WHY PAY MORE?

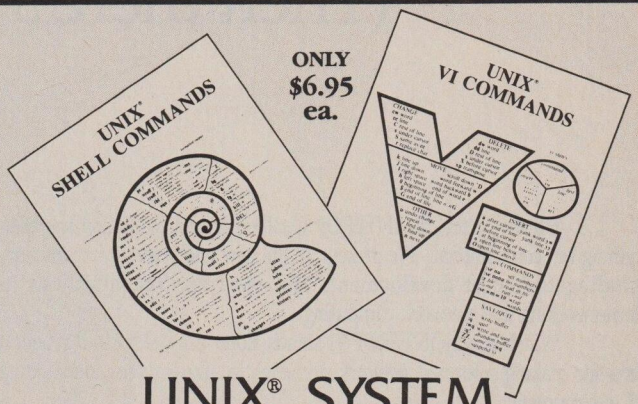
• Dealer price for 8-user board. 16-user upgrade add $199
Price is complete. 16 port pannel and software included.

5 Years limited warrenty

Distributors, Dealers, VARs' inquiry welcomed

DTS **DATATRANS SYSTEMS, INC.**
35-28 154th STREET FLUSHING, N.Y. 11354
Tel. 718-445-6970 Fax. 718-461-2822
1-800-368-1688

CIRCLE NO. 97 ON INQUIRY CARD



UNIX® SYSTEM POSTERS

• Large Size 22" x 28"
• Printed In 2-Colors

ALL ORDERS MUST BE PREPAID

MAIL COUPON TO:
UNIX WORLD
444 Castro Street
Mtn. View, CA 94041

☐ Enclosed is my check (or charge my credit card) for payment in full including shipping and handling

STYLE	QTY	PRICE	TOTAL
SHELL		$6.95	
VI		$6.95	
		SUB TOTAL	
California Residents Add 6.5% TAX			
Shipping & Handling			$3.50
Shipments outside U.S.A. Add $7.00			
		TOTAL	

☐ VISA ☐ MasterCard ☐ AMEX
CARD NO. _____
EXP. DATE _____
SIGNATURE _____
NAME _____ (Please Print)
ADDRESS _____
CITY _____
STATE _____ ZIP _____

Unix is a registered trademark of AT&T.
UNIX WORLD is not affiliated with AT&T.

TO ORDER BY PHONE CALL (415) 940-1500

Open Systems Solutions To Fit Your Business Needs.

Whether your business is small or multinational, UNIX® OPEN SOLUTIONS '91 provides the single best opportunity for you to learn how interoperable open systems can improve your productivity and efficiency—and help you grow.

The whole focus will be on ***ready-to-work applications for interoperable environments.*** But, unlike other UNIX-specific shows, end-user issues will be balanced between implementation and management strategies.

Call now for information. Attendees: (617) 449-8938. Exhibitors: (617) 449-6600, extension 4023.

The entire show floor will feature open systems and networking. So you'll be able to evaluate hundreds of the latest business applications, products, systems and services.

A special Open Systems Area highlighting live demonstrations of OSI business applications will give you a unique understanding of how enterprise-wide solutions can help you manage your high-end business tasks.

And to further demystify open systems, you'll have access to 40 or more conference sessions and tutorials, chaired by leading consultants, vendors and users.

If you're a business or technical manager, senior executive, consultant or reseller, you'll find real-world, open systems solutions to fit your business needs at UNIX OPEN SOLUTIONS '91.

UNIX®
OPEN SOLUTIONS 91
EXPOSITION AND CONFERENCE
Open Systems for Business

September 4–6, 1991
San Jose Convention Center
San Jose, CA U.S.A.

Produced by ☒THE INTERFACE GROUP ©1991
300 First Avenue, Needham, MA 02194-2722 U.S.A.
UNIX is a registered trademark of UNIX System Laboratories, Inc.

CIRCLE NO. 71 ON INQUIRY CARD 2758FIF0

ADVERTISERS' INDEX

To receive more information about products or services advertised in UNIXWORLD, please fill out a Reader Inquiry Card using the ad number that appears at the bottom of the advertisement.

	PAGE NO.	INQUIRY NO.
Advance Micro Research	90,91	49
Advanced Logic Research	19	14
AIX Expo '91	164	141
APD S.A.	162	182
APD S.A.	168	195
APPGEN Business Software	8	122
Arnet Corp.	89	189
Ashton-Tate	63	18
ASK Computer	48,49	91
Berkeley Decision/Systems	114	86
Berkeley Decision/Systems	165	87
Century Software	30	65
Chase Research Inc.	82	220
CLEO Communications	95	—
Coconut Computing	173	72
Comprehensive Systems	172	7
Comtrol Corp.	174,Cover III	149
Connect Tech	40	98
Consensys Corp.	43	173
Contemporary Cybernetics Group	9	134
Corollary Inc.	23	95
Courseware Technologies Inc.	28	114
CYANTIC Systems	128	17
DATATRANS Systems Inc.	148	97
Datability Systems	1,2,3	106
DIAB Data	120	132
Dialogic Corp.	140	119
Dickens Data Systems	17	187
DigiBoard	33-38	—
Digital Equipment Corp.	113	—
Empress Software Inc.	109	218
Enhanced Software Tech's. Inc.	74	77
Epoch Systems	44	229
Equinox Systems	65	210
ERI-Electrorep	53,55,155	—
ESIX Systems Inc.	Cover II	124
Exabyte Corp.	101	62
Feith Systems & Software	173	121
First Computer Consultants	52	10
Four Seasons Software	124	243
GCOM Inc.	173	38
Georgia Tech Continuing Ed.	146	—
Hands On Learning Corporation	173	197
Helios USA	79	23
Hewlett Packard (Workstations)	156,157	233
IBM AIX	6,7	—
Image Network	137	148
Infoflex Inc.	42	183
Information Builders Inc.	76	178
Interface Group	149	71
INTEROP Inc.	147	66
Island Graphics Corp.	105	186
IXI Limited	115	260
James River Group Inc.	73,75	—
Lantronix	27	219
Lone Star Computer Services	126	166
Lynx Software	50	153
Mark Williams Company	87	—
Maximum Computer Tech.	54	8
Maxpeed	32	170
MCBA Inc.	161	61
Megascore Inc.	8	12
Microlite Corp.	131	176
Microport Systems Inc.	160	60
Minicomputer Exchange	126	35
MultiTech Systems	92	171
Network Computing Dev. Inc.	56,57	254
N.R.I./Systems-Software	170	—
Oakland Group Inc., The	142	177
Ontrack Data Recovery Inc.	173	15
Oracle Corp.	14	—
Orange Systems	145	201
Oregon Software	127	21
O'Reilly & Associates Inc.	141	142
Overland Data Inc.	145	150
Pacer Software Inc.	152	192
Pacific Access Corp.	133	240
Power Place, The	40	185
Prentice-Hall	108	94
Programmed Intelligence Corp.	71	129
PROGRESS Software Products	106	133
QMS Inc.	163	68
Quality Software Products	26	69
QualTrak	173	70
QualTrak	173	75
Raima Corp.	116	90
RDI	12,13	101
Recital Corp.	20	244
Santa Cruz Operation	Cover IV	84
Sea Change Corp.	131	64
Silicon Graphics Inc.	172	—
Sony Microsystems	41	228
Specialix Inc.	129	209
SPSS Inc.	29	174
Stallion Technologies Inc.	130	191
Starburst Inc.	172	110
Storage Dimensions	68	252
Structured Logic Systems	173	242
SunExpo '91	158	207
Systems Strategies Inc.	103	100
Techgnosis	159	249
Telebit Corp.	46,47	215
TGV Inc.	85	158
Tri-Gem (USA)	80,81	204
Unidirect	42	30
UniPress Software Inc.	97	—
UniTrends	128	127
UNIX EXPO Int'l	169	188
VI Corp.	110	57
Virtual Prototypes Inc.	10	216
Walker Richer & Quinn Inc.	24	125
Western Pacific Data Systems	173	48
Word Marc Int'l. Corp.	134	—
Wyse Technology Inc.	66,67,74	145
Z/Max Computer Solutions	123	221

The ad index is published as a service. The publisher does not assume any liability for errors or omissions.

SHOWS & CONFERENCES

Xhibition 91: June 3-6
The Xhibition 91 conference and trade show is directed to developers and planners. The event will include tutorials and a technical program of panels and seminars focusing on open systems and distributed computing. Particular emphasis will be placed on the X Window System as the first working example of an open system.

The program is designed to answer general questions about X, open systems, and distributed computing, addressing issues of their importance, capabilities, benefits, and respective roles in the future of computing.

Professionals from industry and academia will share their views on software applications, tools, and techniques critical to the development and utilization of open systems. The technical panels and seminars will address topics including: application portability and interoperability; legal and ethical considerations related to software, as well as X terminals, displays, toolkit strategies, and performance on various systems including UNIX.

More than 100 vendors will take part in the trade show. The event will be held at the San Jose Convention Center, San Jose, Calif. Contact Integrated Computer Solutions Inc., 617-547-0510.

Object World: June 3-7
Chief information officers, information system managers, system development managers, and related professionals are the targeted audience of Object World. The seminars, program sessions, and exhibits will focus exclusively on commercial aspects of object technology.

Colin Crook, chairman of Citicorp Technology Committee and developer of the Motorola 6800 and 68000 microprocessors, will give the keynote address on how open architectures can create new opportunities for information systems. Among those also scheduled to speak are Esther Dyson, *Release 1.0*; Christopher Stone, Object Management Group; Brad Cox, Stepstone; and John Rymer, Seybold Office Computing.

The five-day program begins with two days of half-day seminars and concludes with three days of program sessions. The program sessions are divided into applications, management, technology, and case study tracks to allow participants to focus on their particular interests.

The show and exhibition will be held at the Fairmont Hotel, San Francisco, Calif. Contact Object World, 800-225-4698 or 508-879-6700.

The Security Impact of Networks, Telecommunications, and Office Automation: June 10-12
This conference will address the need for security solutions within increasingly decentralized and interconnected computing environments. Particular emphasis will be placed on practical and cost-effective means to address security problems.

Keynote speaker Earl E. Devaney, special agent in the fraud division of the U.S. Secret Service, will discuss issues related to prosecuting computer criminals.

Sponsored by the Computer Security Institute, the conference will include workshops and panel discussions scheduled around a seven-track program with focus on local-area networks, telecommunications, large systems, office automation, management, or foundations of information security.

UNIX and open system security, information security in UNIX networks, legal aspects of computer security, and an update on federal computer security regulations are among the more than 40 scheduled workshop and discussion topics. The conference will be held at the Denver Marriott City Center, Denver, Colo. Contact The Computer Security Institute, 503-624-2118.

Usenix Summer Technical Conference and Exhibition: June 10-14
"Multimedia: For Now and the Future," is the focus of this event that will address the issues involved with supporting and delivering new types of user interfaces including voice, video, animated graphics, touch, and music. The topic will be addressed through investigation of technical engineering requirements for these new types of data and design of new multimedia interfaces to improve information handling.

Scheduled activities include technical paper presentations, panel discussions, demonstrations of multimedia projects, tutorial sessions, and a three-day vendor exhibition.

The conference will be held at the Opryland Hotel, Nashville, Tenn. Contact Cynthia Deno, Usenix Association, 408-335-5646.

continued on page 174

UNIXWORLD

HOME OFFICE
444 Castro St., Ste. 200
Mountain View, CA 94041
415-940-1500
FAX: 415-967-1257

ADMINISTRATION:
Publisher: Robert Billhimer
Marketing Manager: Donna Wood Tyrus
Market Research: Gail Potthoff
List Rental: Verlene J. Perry
Ad Traffic: Jeanne A. Ketchum
Ad Traffic Asst: Angela V. Owens

ADVERTISING SALES:
National Sales Mgr.: David E. Pearson
Marketplace/Postcards: David E. Pearson
Classified/Recruitment: David E. Pearson

SALES OFFICES:
Northwest/Southwest
AK, AZ, CA, HI, ID, NV, OR, UT, WA, & Western Canada

Eric Kazanjian
Elizabeth Martin
444 Castro St., Ste. 200
Mountain View, CA 94041
415-940-1500
FAX: 415-967-1257

Central
AR, CO, IA, IN, KS, KY, LA, MI, MN, MS, MO, MT, ND, NE, NM, OH, OK, W. PA, SD, TN, TX, WI, WV, WY, & Central Canada

Robert D. Wentz
McGraw-Hill, Inc.
Two Prudential Plaza
180 N. Stetson
Chicago, IL 60601
312-616-3315
FAX: 312-616-3323

Northeast
CT, MA, ME, NH, N. NY, RI, VT, & Eastern Canada

John C. Moon
McGraw-Hill, Inc.
24 Hartwell Ave.
Lexington, MA 02173
617-860-6289
FAX: 617-860-6276

Mid-Atlantic
DC, DE, MD, NJ, S. NY, E. PA, VA

Ann Honomichl
McGraw-Hill, Inc.
1221 Ave of the Americas
28th Floor
New York, NY 10020
212-512-3372
FAX 212-512-4717

Southeast
AL, FL, GA, NC, SC

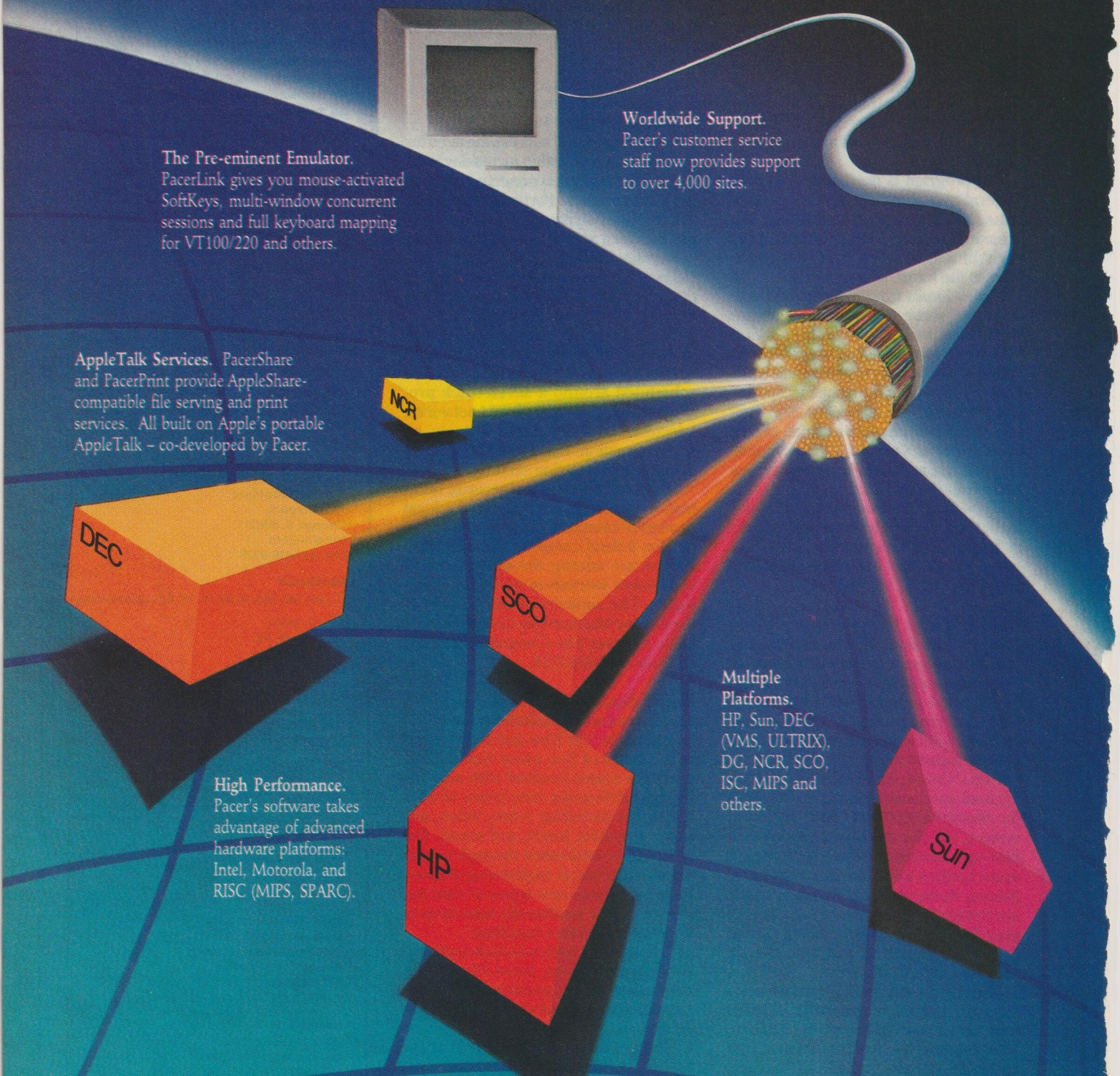
John C. Moon
McGraw-Hill, Inc.
24 Hartwell Ave.
Lexington, MA 02173
617-860-6289
FAX: 617-860-6276

International
David E. Pearson
444 Castro St., Ste. 200
Mountain View, CA 94041
415-940-1500
FAX: 415-967-1257

Bring Your Macs into the UNIX World.

Now Macintosh users can access all the applications, files and processing power of a UNIX server – at the touch of a mouse. With unsurpassed terminal emulation and file sharing capabilities, Pacer spans the entire UNIX universe. To learn more about Pacer software, call 619-454-0565 (in the west) or 508-898-3300 (in the east). And get the best of both worlds.

Pacer SOFTWARE



The Pre-eminent Emulator. PacerLink gives you mouse-activated SoftKeys, multi-window concurrent sessions and full keyboard mapping for VT100/220 and others.

Worldwide Support. Pacer's customer service staff now provides support to over 4,000 sites.

AppleTalk Services. PacerShare and PacerPrint provide AppleShare-compatible file serving and print services. All built on Apple's portable AppleTalk – co-developed by Pacer.

High Performance. Pacer's software takes advantage of advanced hardware platforms: Intel, Motorola, and RISC (MIPS, SPARC).

Multiple Platforms. HP, Sun, DEC (VMS, ULTRIX), DG, NCR, SCO, ISC, MIPS and others.

PACER SOFTWARE, Inc., 7911 Herschel Avenue, Suite 402, La Jolla, CA 92037 (619) 454-0565; 1900 West Park Drive, Suite 280, Westborough, MA 01581 (508) 898-3300; Pacer Europe S.A., Valbonne, France (33) 93 653 008; Pacer Australia, French Forest, NSW (61) 2975 3706; Canon Sales Company, Inc., Tokyo, Japan (81) 3 3455 9144; NOCOM, Uppsala, Sweden (46) 18 321090. PacerLink, PacerShare and PacerPrint are registered trademarks of Pacer Software, Inc.; Apple, AppleShare and AppleTalk are trademarks and Macintosh is a registered trademark of Apple Computer, Inc.; UNIX is a registered trademark of American Telephone and Telegraph Company. All other product names subject to trademark claims.

CIRCLE NO. 192 ON INQUIRY CARD

SOFTWARE DEVELOPMENT ACROSS PLATFORMS AND NETWORKS

There's nothing new about graphical user interface (GUI) builders. Visual Edge, Telesoft, Nixdorf, and others all sell software that lets you design a GUI for your application that conforms to one, or maybe two, windowing systems. There's nothing new about software that lets you create GUIs across different platforms. SL Corp. and V.I. Corp sell software that lets you port your interface code to another machine.

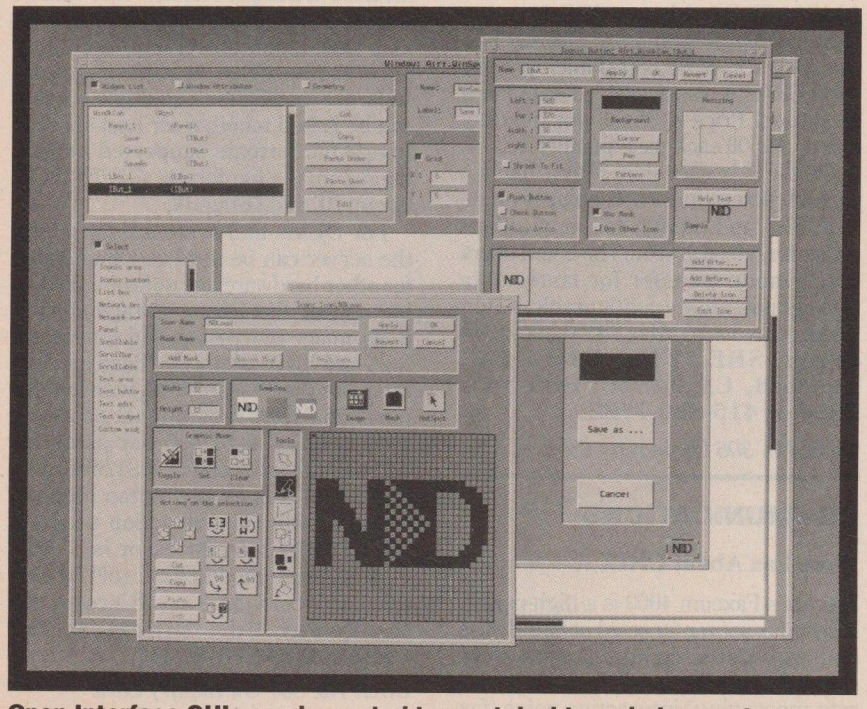
What's new is the ability to combine these two concepts. Like XVT's XVT, Neuron Data's Open Interface software has come out with software to let you create GUIs conforming to the most widely used desktop window systems: Macintosh, Windows, OS/2 Presentation Manager, Motif, and Open Look. After you've created the interface, you can port it to any other of these windowing systems.

Within Open Interface is Open Editor, what Neuron Data calls a WYSIWYG interface builder. It generates portable C code and resource files for the description of the interface. Along with Open Editor are libraries for each windowing environment. The libraries contain function calls for displaying objects, moving data in and out of objects, and managing the application environment.

After building the interface with Open Editor on the developer's platform of choice, the developer then adds application-specific functionality. Upon completion of this step, the code is compiled and linked to the platform-specific libraries. This transfers the look-and-feel of the interface from the platform it was developed on to any of the desired platforms.

Open Interface development licenses are currently available for $12,000 for Sun, Digital Equipment Corp., IBM, Hewlett-Packard Apollo, and PC-based UNIX platforms. Runtime licenses are $500 each. Quantity discounts; site licenses; value-added reseller and original equipment manufacturer (OEM) licensing programs; and DOS, Macintosh, and OS/2 development licenses are also available. **Neuron Data, 156 University Ave., Palo Alto, CA 94301; 415-321-4488.**

Circle No. 302 On Inquiry Card



Open Interface GUIs can be ported to most desktop window systems.

What Makes Sammi Run?

From GUIs to GUEs–that's graphical user environment. When companies twist an industry buzzword, it's usually their way of creating a marketing niche, but Kinesix may be onto something with its product. Sammi combines X Windows capability with remote procedure calls across a network of clients and servers. The goal is two-fold: to enable software developers to create applications that can access information in remote sites, but without their necessarily having to learn the programming calls or communications protocols required to build a complicated network computing application.

Because Kinesix envisions Sammi being used in real-time and process control applications, it has incorporated the standard components of these fields into the product. The color-coded widgets include meters, gauges, bars, graphs, literal or symbolic displays, equations, menus, and push buttons. Users will be able to access and receive information about the entire network environment through the graphical interface, hence the GUE name.

The Sammi software has three components. Its runtime environment handles the display, data communication, and user commands. The format editor is used to create the links between the applications. The third component, the application programming interface, is designed to let the programmer create a customized interface between the source of the data and the display of the data.

Platforms include Sun, IBM PS/2s and RS/6000s running AIX, DECstations running Ultrix, and HP Apollo workstations. Prices range from $12,500 to $25,000, depending on configuration. **Kinesix, 10333 Richmond Ave., Ste. 1100, Houston, TX 77042; 713-953-8300.**

Circle No. 303 On Inquiry Card

continued

BOARDS AND CONTROLLERS

Single-Board Computers in General

General Micro Systems adds several new VMEbus-based single-board computers to its board-level products line. The GMS V36 and GMS V49 target the same market as Motorola's MVME147, with the V36 incorporating the 40-MHz 68030 CPU and the V49 incorporating the 25-MHz 68040. Both include I/O interfaces for Ethernet, SCSI, and eight channels of RS-232 or RS-422 lines. Also on the boards are two or eight megabytes of dynamic random access memory (DRAM), and one megabyte of static random access memory. Quantity one price for the GMS V36 is $2,395, or $1,800 each past quantity 100; for the GMS V49, quantity one price is $5,995, or $3,600 each past quantity 100.

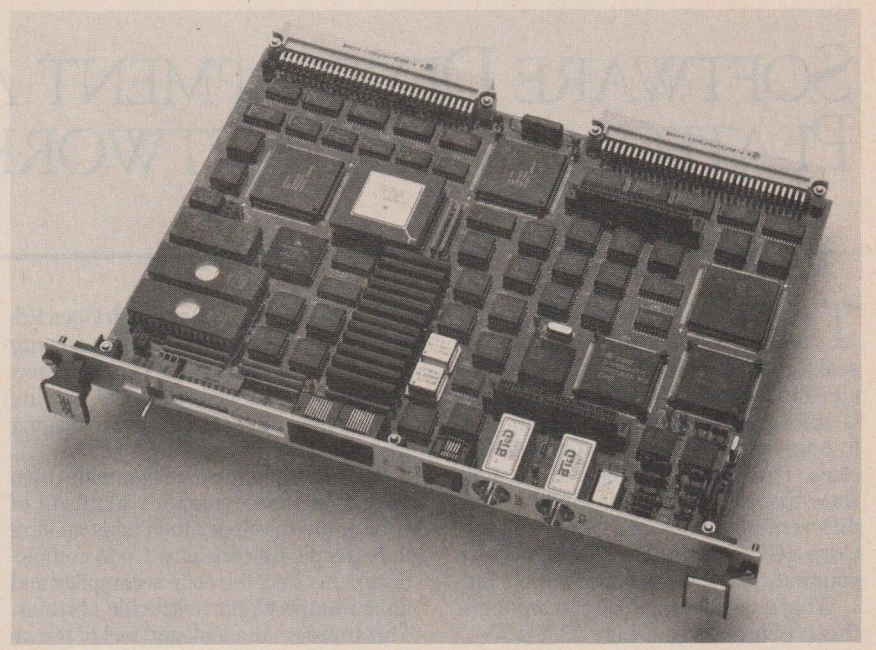
Also available is the VMEbus-based V05sx dual-ported memory board, providing 32 or 64 megabytes of dynamic memory with a 32-bit expansion bus for direct access to the CPU. It uses two-way interleaved DRAM on the board, and supports synchronous terminal read/write cycles from the CPU, and can act as a block mode slave to the CPU cache so that sub-zero-wait memory access can take place over the local bus. Quantity one prices are $6,995 for the 32-megabyte version, and $9,995 for the 64-megabyte version; an error-correction daughterboard is available for $1,495. **General Micro Systems, 4740 Brooks St., Montclair, CA 91763; 714-625-5475.**

Circle No. 304 On Inquiry Card

Using Force

Force Computers' CPU-40 single-board computer utilizes Motorola's 68040 processor on a VMEbus board. It's designed to bring 15-mips performance to embedded and real-time applications in automation, telecommunications, and medical systems, among others. The CPU-40 features a 32-bit interface for plugging in daughterboards that Force calls Eagle modules. The modules are designed so that a system designer can run both the CPU board and the I/O subsystem from a single VMEbus slot. The CPU-40 is available with four or 16 megabytes of DRAM. Prices start at $3,990 without the Eagle module, and $5,490 with the Eagle module and four megabytes of memory. **Force Computers, 3165 Winchester Blvd., Campbell, CA 95008; 408-370-6300.**

Circle No. 305 On Inquiry Card



SBE's fiber distributed data interface board, the VCOM-100

Have Your FDDI and Ethernet Too

Targeting Interphase's VMEbus fiber distributed data interface (FDDI) board, SBE has introduced an FDDI board of its own, the VCOM-100. The board is designed for OEMs and system integrators looking for a single interface between an FDDI local-area network (LAN) and VME-based systems, including workstations, bridges, and routers. Unlike the Interphase board, which uses AMD's FDDI chipset, SBE is using National Semiconductor chipset and Motorola's 25-MHz 68030 microprocessor. TCP/IP is also available for onboard execution. Price is $5,900 for quantity one or $4,500 each past quantity 100.

On the Ethernet side, SBE is using a second-generation VME chipset on its VLAN-E2, an Ethernet communications controller priced at $995. The board offers block mode transfer for faster data throughput, a user-configurable Ethernet port, and a 16-MHz 68020 microprocessor. **SBE, 2400 Bisso Ln., Concord, CA 94520; 800-347-2666 or 415-680-7722.**

Circle No. 306 On Inquiry Card

COMMUNICATIONS

More Fax About UNIX

Biscom's Faxcom 4000 is a high-performance fax server targeted at both LANs and high-traffic communication environments. Applications include corporate messaging, interactive voice/fax response, store-and-forward capabilities, e-mail, and electronic data interchange.

As an independent server, the Faxcom 4000 can plug into the Ethernet or connect directly to a host via serial lines. It uses a Posix-compliant UNIX System V Release 3 (SVR3) operating system and software modules developed by Biscom.

Multiple intelligent fax ports can be installed in a single Faxcom 4000 chassis (eight in a standard chassis, 16 in a 19-inch rack-mounted version) and more ports can be added as traffic increases. In larger installations, multiple servers can be linked together for load sharing. Image file formats supported include tagged image file format (TIFF), PCX, Group III, and Group IV.

For OEMs and system integrators, the server can be used as a foundation for other hardware and software, including optical disk image storage applications, image processing, and support for X.25 and X.400 protocols. Base configuration for the Faxcom 4000, with four fax ports, is $15,995; additional ports are sold in pairs at $2,495 per pair. The TCP/IP Ethernet option is $1,595, and a PostScript processing option incorporating a reduced instruction set computing (RISC) coprocessor is $5,995. Host software modules are sold by platform and configuration. **Biscom, 85 Rangeway Rd., Billerica, MA 01821; 508-670-5521.**

Circle No. 307 On Inquiry Card

continued

Office Automation.

Now It's All On UNIX And It's All From ERI.

You've been wanting to move to the multi-user, multi-tasking environment of UNIX, but were concerned about applications.

Wait no longer. ERI designs comprehensive, networked office automation solutions using the UNIX versions of leading PC applications. Performance and productivity are immediate because there's no need for user re-training. For example:

- Lotus 1-2-3 for UNIX has all the familiar features including 3D spreadsheets, presentation-quality graphics, full macros and the 1-2-3 user interface.
- WordPerfect 5.0 for UNIX Systems strikes the perfect balance between powerful word processing and graphic import capabilities.
- dBASE IV for UNIX provides complete file and program compatibility between DOS, UNIX and other platforms.

When combined with advanced applications developed on UNIX, your office automation system will excel. Island Graphic's Island Write, Paint and Draw produces crisp presentations and impressively polished documents. And Frame Technology's FrameMaker is the complete workstation publishing software. It lets you integrate layout, word processing, math equations and graphics capabilities. In addition, user interfaces can be customized with VISIX Looking Glass, allowing you to move easily between applications with the click of a mouse.

And by using Sun Microsystems workstations as the platform, ERI's Office Automation solutions eliminate the need for out-moded DOS-based PCs, and cumbersome mainframe-connected terminals.

Start moving up to UNIX-based Office Automation from ERI. Call us today at (800) 222-1050. Ask for Dept. K.

ERI™

Answering your needs today.
Anticipating your needs for tomorrow.

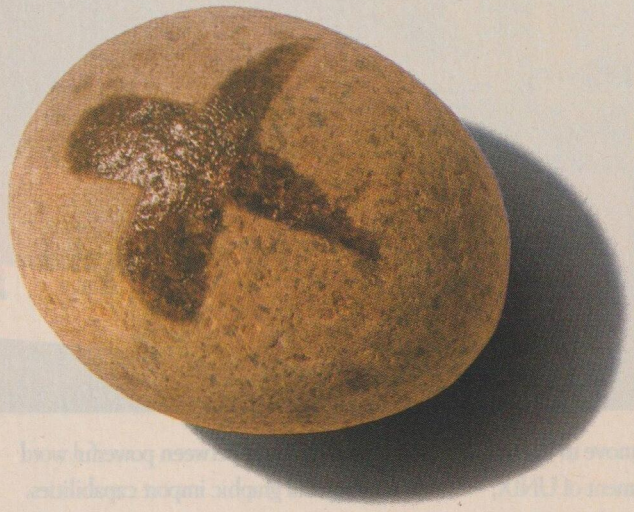
Corporate Headquarters: 180 Vanderbilt Motor Parkway, Hauppauge, NY 11788-9682
(800) 222-1050 Fax (516) 435-0995

Lotus Frame WordPerfect®
ISLAND GRAPHICS CORP.
AshtonTate VISIX

Sun microsystems Value Added Reseller

All names, products and services mentioned are the trademarks or registered trademarks of their respective organizations.

Stone.



NCD 17c X terminal.
29,000 X stones.

The new HP 700/RX family of X stations has opened up a huge lead in the X stone race.

The first family based on RISC, it's also the first to offer entry-level workstation X performance at X terminal prices. So you can run demanding X applications you'd never have considered before.

Now that you can enjoy the performance benefits of RISC at no extra cost, what are you waiting for? Because every day without RISC, you're falling further behind.

Our full range of color models performs at least two times better than NCD or Tektronix.

Even our monochrome X station comes in at 60,000 X stones.

All HP 700/RX models use flicker-free monitors, with high refresh rates. You have a choice of 19" color or monochrome with 1280 x 1024 high resolution, and 16" color with 1024 x 768.

© 1991 Hewlett-Packard Company CCGA001
[1]4/91, [2]2/91, [3]1/91

Milestone.

HP RISC X station.
75,000 X stones.

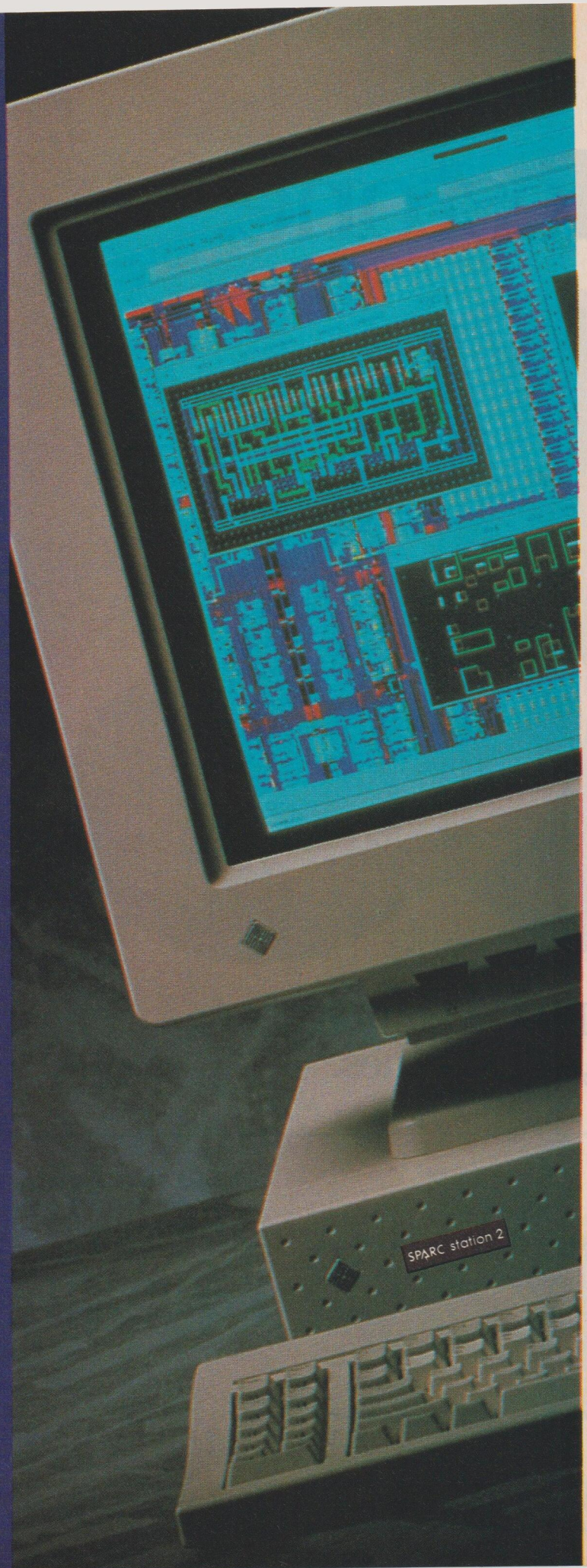
No wonder HP was recognized by Dataquest,[1] International Data Corporation[2] and the X Business Group[3] as the industry's leading supplier of color X terminals in 1990.

So call **1-800-752-0900, Ext. 2306** and meet the first family of RISC X terminals. With these milestones, your company could go a lot further.

HEWLETT PACKARD

CIRCLE NO. 233 ON INQUIRY CARD

SUN EXPO



SUN OPEN SYSTEMS EXPO
SOSE™

THE WORLDS LARGEST SUN COMPATIBLE TRADE SHOW

- More than 150 Exhibitors in 50,000 feet of exhibit area
- Over 10 full day Turorials by Sun Educational Services and UNIX Community authorities
- Over 50 technical sessions, roundtables and workshops chaired by knowledgable industry experts, users and vendors

San Jose
Convention Center
July 23-25, 1991

CALL: 800-727-EXPO or
512-331-7761 Weekdays
Fax 512-250-9756

A P.C.I. Sponsored Event

CIRCLE NO. 207 ON INQUIRY CARD

A Different Kind of ZIP Code

ZipMail e-mail software targets UNIX or proprietary multiplatform environments. It supports common UNIX mail transport agents such as sendmail, smail, /bin/mail, and any others compatible with Simple Mail Transfer Protocol and UUCP protocols. It also works with gateways to IBM's PROFS office system, DEC VMS-based systems, and PC or Apple networks. Besides availability across platforms, ZipMail works across several interfaces, including Open Look, Motif, full-screen, and the command-line as well.

With ZipMail, you can open and search multiple folders at the same time; trace multiple-message conversations and piece them back together; use corporate forms and templates; merge messages into digests, and attach code, documents, graphics, and audio messages. The software can also sort and file mail without your having to read it. Prices start at $295 per user, with a 16-user site license priced at $2,395. **Siren Software, 750 Menlo Ave., Ste. 200, Menlo Park, CA 94025; 800-457-4736 or 415-322-0600.**

Circle No. 308 On Inquiry Card

Yes, But How do you Pronounce It?

Adax has developed software designed to link internet protocol-based (IP) applications over wide-area networks called SNDCF (sub-network dependent convergent function). The software is designed to transparently link TCP, Network File System (NFS), or Open Systems Interconnect over private or public X.25 packet-switched networks. SNDCF links to the internet protocol via a link-level interface specification. It converts IP datagrams into X.25 packet address format for insertion into TCP packages from AT&T, HP, Intel, Wollongong, The Santa Cruz Operation, Interactive, and Unisys. Prices start at $395. **Adax, 630 Bancroft Way, Berkeley, CA 94710; 415-548-7047.**

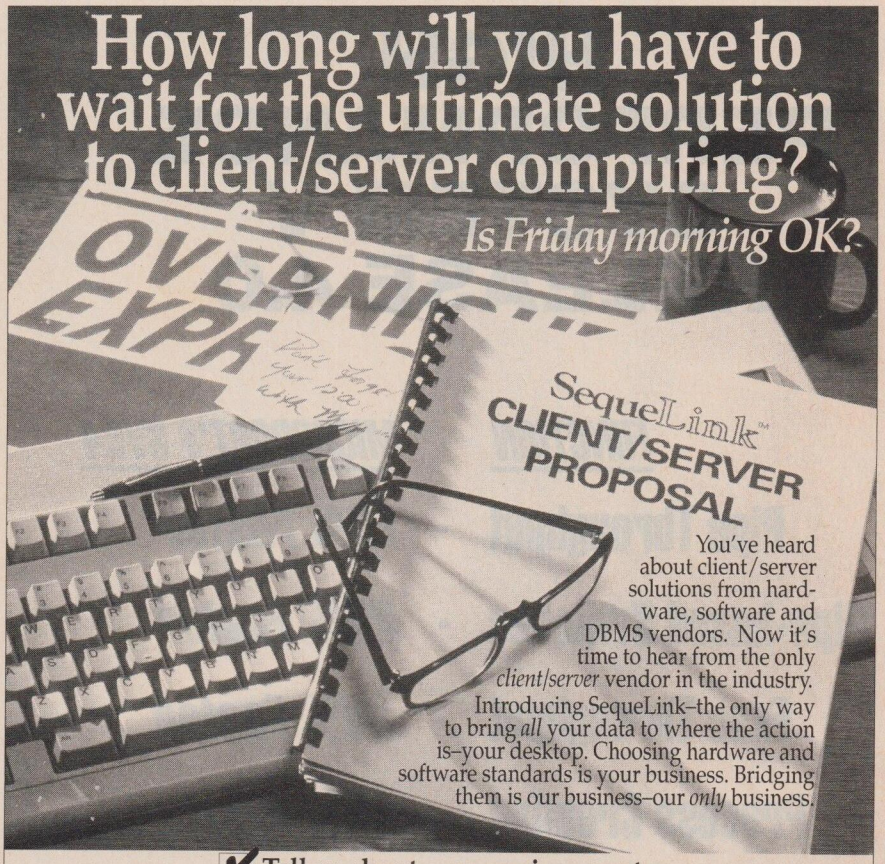
Circle No. 309 On Inquiry Card

NETWORK HARDWARE

The Network According to Synoptics

Branching out from its network hub products, Synoptics has developed a subsystem and software for network management. The hardware, the Network Control Engine (NCE), is SPARC-based, while the UNIX-based network management software, is compatible with Sun's SunNet Manager software. Software for DOS, Windows, and IBM NetView is also available. The subsystem links to its LattisNet System 3000 network hub via any of three backplane connections–Ethernet, token ring, or FDDI.

The NCE gathers and analyzes data, which can then either be processed locally or sent to a central management station. It has a 12-mips SPARC-based engine and comes with a 104-megabyte hard drive for storage of local information, such as network configuration and threshold parameters. Optional with the NCE are protocol analysis and load profiling capabilities. List price for



✔ **Tell us about your environment.**
Fax this ad to (407) 241-6143 or call toll free: (800) 321-0543.
You'll have the solution on your desk by Friday morning.

SERVER	DBMS	NETWORK	CLIENT	APPLICATIONS
☐ AS/400	☐ ORACLE	☐ NETBIOS	☐ WINDOWS 3	☐ EXCEL
☐ VAX/VMS	☐ RDB	☐ TCP/IP	☐ MACINTOSH	☐ WINGZ
☐ UNIX	☐ INGRES	☐ DECNET	☐ UNIX	☐ EASEL
☐ MVS	☐ SYBASE	☐ APPC	☐ OS/2	☐ HYPERCARD
☐ OS/2	☐ DB2	☐ APPLETALK	☐ _____	☐ TOOLBOOK
☐ VM	☐ SQL/400	☐ _____		☐ 4TH DIMENSION
☐ _____	☐ SQL SERVER			☐ SMALLTALK
	☐ OS/2 DBM			☐ _____
	☐ INFORMIX			
	☐ _____			

Client/Server MiddleWare™
SequeLink™
A product of TechGnosis, Inc.
301 Yamato Road, Suite 2200
Boca Raton, FL 33431
(800) 321-0543 or (407) 994-4958
Registered trademarks are proprietary to their respective manufacturers.

NAME
COMPANY
ADDRESS
CITY STATE ZIP
TELEPHONE

CIRCLE NO. 249 ON INQUIRY CARD

800-FOR-UNIX

HIGH PERFORMANCE SYSTEM V RELEASE 4.0

FUNCTION	-	MICROPORT'S SVR4
Pipe Throughput	-	19% Faster
Pipe-based Switches	-	25% Faster
Exec Throughput	-	30% Faster
Process Creation	-	35% Faster
Multi-User Timesharing	-	54% Faster

Based upon the MUSBUS and PITS benchmarks, compared with Unix System Laboratories® current release of SVR4, running on a 33 MHz386 ISA bus host with 8 Mb ram and a 300 Mb hard disk.

Microport sells System V UNIX.®

... for 286, 386 and 486 systems,
with graphics, networking, and development tools, offering portability, compatibility and standards, and an enhanced commercial release of SVR4.

MICROPORT

30 JANIS WAY • SUITE A • SCOTTS VALLEY, CA 95066 • 408-438-8649 • FAX: 408-438-7560

UNIX is a trademark of Unix System Laboratories

CIRCLE NO. 60 ON INQUIRY CARD

the hardware is $9,995.

The LattisNet Network Management for UNIX software breaks down the view of the network in four ways, including views of the entire network, the network between routers or bridges, or the network linked to a particular hub. The price of $7,000 includes the cost of SunNet Manager. **SynOptics, 4401 Great America Pkwy., P.O. Box 58185, Santa Clara, CA 95052-8185; 408-988-2400.**

Circle No. 310 On Inquiry Card

OUTPUT DEVICES

Gentlemen, Start your Print Engines

Gammadata's GammaColor System 300 family of products works with Sun's NewsPrint software in environments with both Sun-3/80 workstations and SPARCstations. At the foundation of the System 300 is a color print engine, available for either 8 1/2-by-11-inch ($5,900) or 11-by-17-inch ($7,450) printing. Depending on the workstation used, a parallel interface card may be required.

The other products in the family, termed "modules" by Gammadata, consist of both hardware and software. The network screen capture system consists of a board for the workstation ($1,450) to do screen capture of images for scaling, rotating, and printing.

An HP Graphics Language plot module consists of a rasterizing board for the print engine ($3,500) and software for the workstation ($695); it allows the user to assign colors to the pens, and set line widths as well. A PostScript module is also available for the workstations at $995 for the SPARCstation or $2,700 for the 3/80. **Gammadata, 1359 Busch Pkwy., Buffalo Grove, IL 60089; 708-541-9119.**

Circle No. 311 On Inquiry Card

Teaching Printers to Share

Patton Electronics' Sharing Switch Model 378S lets you plug in eight RS-232 serial output devices so they can share a single printer or plotter. The Model 378S polls all the devices once each second, and then spools the data into memory (up to one megabyte), and then over to the output device. It allows I/O rates up to 19.2 kilobytes per second and supports both hardware and software handshaking methods. It also has a button to override automatic scanning, and a "clear buffer" button. Two indicators show which port is being scanned or loaded, and what percentage

HP=MCBA²

The Equation of Open Reliability

You don't have to be an Einstein to know the formula for reliability in today's open business systems environment.

For over 10 years MCBA has been a leading provider of fully integrated business software on Hewlett-Packard HP 3000 computers. *HP Professional* magazine lists MCBA as the leading supplier of accounting software for the HP 3000 with *over 20% of the market share.*

And now HP and MCBA have applied their equation of success to open systems solutions. Industry-proven, UNIX-based software for accounting, distribution and manufacturing combined with the power of HP 9000/800 computers help your business stay competitive in the 90's.

HP's 9000/800 family of computers offers you the most extensive line of RISC servers based on UNIX in the industry. Regardless of your company's size, there's a versatile HP 9000/800 server that works cost-effectively in your business.

Reliability is MCBA's trademark. Since 1974 MCBA's dependable and feature-rich CLASSIC Software has helped 30,000 users worldwide manage their business—from general accounting to wholesale distribution to closed-loop manufacturing resource planning (MRP II).

New relational database and user interface technology enhance MCBA's economical yet comprehensive business software to offer you the added benefits of 4GL development and reporting tools. Windows and context-sensitive on-line help add ease of use.

If you want the right formula for solving your business needs in the 90's, get on line with HP and MCBA. Contact an MCBA representative today by phone at (818) 242-9600 or FAX (818) 500-4805.

Reseller and Distributor inquiries invited.

MCBA CLASSIC Software For HP's UNIX® -Based 9000/800 Systems

HEWLETT PACKARD
Premier Solution Provider

MCBA®

MCBA, Inc. • 425 W. Broadway • Glendale, CA 91204 • USA • Phone (818) 242-9600 • FAX (818) 500-4805

Copyright © 1991 by MCBA, Inc. All rights reserved. MCBA is a registered trademark of MCBA, Inc. All other product or brand names are trademarks or registered trademarks of their respective companies.

CIRCLE NO. 61 ON INQUIRY CARD

of buffer space is available. Cost is $295 without the buffer. **Patton Electronics, 7958 Cessna Ave., Gaithersburg, MD 20879; 301-975-1000.**

Circle No. 312 On Inquiry Card

POTPOURRI

ImageCels Sells Images

ImageTects' ImageCels comes on a CD-ROM, compatible with a variety of file formats and platforms, including TIFF for UNIX and Pict for Apple. Designed for use with animation, rendering, painting, drawing, and desktop publishing software, ImageCels lets you incorporate any of 1,150 texture maps and imagery into images. Choices include photo-realistic brick, marble, metals, roofs, stone, tiles, backgrounds, designer textures, and landscape images such as trees and clouds.

Though initially targeted to computer-aided design and publishing applications, ImageCels images can also be used in interior design, architectural, and landscape applications. ImageTects also uses a proprietary pattern matching technology that allows for seamless mapping of textures around other objects. The CD-ROM can be used with VGA, 16-, 24-, or 32-bit graphics adapters. Price is $395. **ImageTects, P.O. Box 4, Saratoga, CA 95071; 408-252-5487.**

Circle No. 313 On Inquiry Card

Islands in the Interstream

Interstream's eNFS software uses proprietary disk scheduling algorithms to improve NFS write performance. The company claims that, installed on an NFS server, the software can reduce disk seek operations by as much as 80 percent. It is also designed to intelligently allocate server resources to provide better disk scheduling, better utilization of NFS daemons, reduced retransmissions, and expanded buffering capability within the server. The software conforms to all NFS protocol requirements. Price is $1,995 for Sun servers, and $995 for desktop machines. Volume discounts available. **Interstream, 1501 Reedsdale St., Pittsburgh, PA 15233; 800-677-7876 or 412-323-8000.**

Circle No. 314 On Inquiry Card

If You Hold it up to Your Ear, You Can Hear the UNIX Roar

Berkeley Decision/Systems' line of Shellware consists of software applications written using Bourne shell scripts. According to BDS, because the Bourne shell is standard on all UNIX systems, the applications will run on any UNIX system. Currently available are GLS, a menu-driven general ledger system for small businesses, and OLH, an online help utility that lists command summary and options for UNIX System V. As an abbreviated list, OLH takes the place of **man** commands. Both applications come with source code for modification or customization. Price is $80 for GLS and $40 for OLH. **Berkeley Decision/Systems, 803 Pine St., Santa Cruz, CA 95062; 408-458-9708.**

Circle No. 315 On Inquiry Card

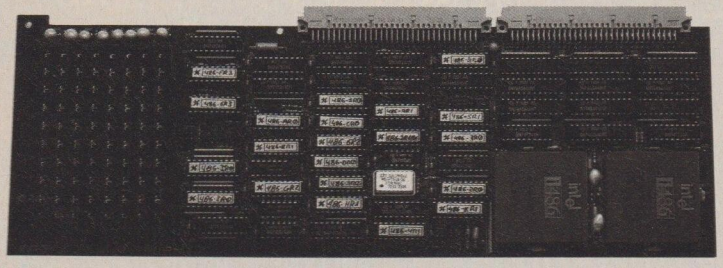
They Also Thought of Calling it the Bee's Knees

Tiger Media's Cats Meow is a tool for creating audiovisual presentations on CD-ROM systems. The software lets you put audio, graphics, and other images in sequence for multimedia presentations. It is compatible with Sun's VideoPix card that lets you capture images from a variety of video sources, and is designed to let non-programmers compile images in order with point-and-click commands. You can also incorporate special effects such as wipes, fades, and dissolves. Price is $995 for a single-user license; runtime packages are also available. **Tiger Media, 5081 E. Slauson Ave., Ste. 200, Los Angeles, CA 90040; 213-721-8282.**

Circle No. 316 On Inquiry Card

Ace in the Lex-Mole

Adding onto its Lex-WP word processing software, Ace Microsystems has developed Lex-Mole, a file management system for SCO UNIX and XENIX systems. Lex-Mole presents the UNIX directory structure in graphical form so that users can access any file by moving the cursor. Users can also browse through files, obtain data about files, and delete files singly or in groups. The software



Build your own i486 AT multiprocessor under UNIX. Introducing the APD Bipro: as easy as plugging a second chip !

Up to 1.9 times faster than single i486 AT (standard benchmarks). Today's most reliable biprocessor architecture (2 x i486 33 Mhz) running ATT UNIX SVR4.0. Simple structure: 100% AT compatible. The CPU board includes 2 x i486 sockets and up to 64 MB. shared memory. Also start with one processor (no extra cost compared against standard i486 AT motherboards) for later upgrading (just plug the second chip). AT standard size, 7 slots (ISA bus), 100% tested, professional reliability systems. Immediate delivery.

Basic platforms:.....From 1.749 $

Complete system :.....From 4.749 $

Parallel O.S.: APDX® biprocessor version (derived & full compatible UNIX SVR4.0): 999 US $

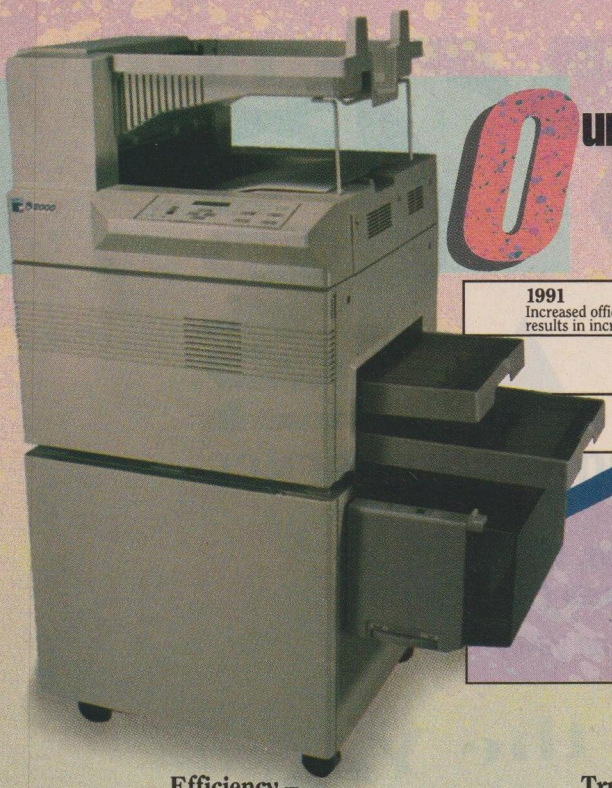
Payment by. Visa / American Express

APD C/ Castelló, 63. 28001. Madrid. Spain
or fax to Peter Howarth. Fax nº.: 34- 1- 575 88 16.

i 486™, AT, UNIX, VGA are trademarks of their respective companies APD Bipro and APDX are registered of APD S.A.

CIRCLE NO. 182 ON INQUIRY CARD

Our New Departmental PostScript Printer Is So Efficient, You Might As Well Say It Prints Money.



Efficiency – The QMS Watchword Of The '90s

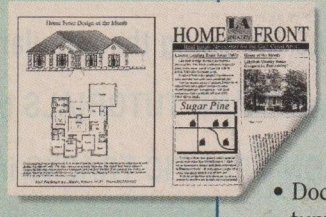
Maintaining one high-duty printer rather than 30 to 40 desktop printers is a cost advantage. That's good. But the real advantage comes when the speed, intelligence and flexibility of the new QMS-PS® 2000 changes an office cost advantage into a departmental profit center!

Easy Connectivity In All Popular Business Environments

The QMS-PS 2000 is perfect for mixed computing environments. It connects easily to EtherNet® or Token Ring® networks to accept TCP/IP, DECnet®, LAN Manager, NetWare® and EtherTalk™ protocols.† Whether your network includes IBM® PC's and compatibles, Macintosh®, DEC® or UNIX® systems, the QMS-PS 2000 is your most efficient solution. It features AppleTalk®, RS-232C serial, Centronics®/Dataproducts® parallel and network interfaces that accept data simultaneously. That means the 2000 can easily serve large, multi-system networks. Its advanced spooling capability virtually eliminates workstation waiting time by storing each document as it's received and printing each in turn. And the 2000 does all this automatically to save time!

True Adobe PostScript Flexibility Plus Automatic Emulation Switching

Now departmental documents can have personality thanks to the 2000 and Adobe® PostScript®. Forty-five resident fonts can be scaled and rotated for effective charts and graphs. And because PostScript is the industry standard, you'll have thousands of useful applications at your fingertips. Switching to non-PostScript applications is literally automatic. QMS's exclusive ESP* technology (Emulation Sensing Processor) interprets incoming data and automatically chooses the appropriate printer language. PostScript, HP® LaserJet® IIP, HP-GL®, LN03® Plus and other emulations are recognized automatically!



Worldwide Service And Support

QMS® is recognized as the leader in advanced PostScript printing technology. Free technical support and our network of service experts are standing by.

Call today and find out how the time-efficient, cost-efficient QMS-PS 2000 can be a departmental profit center for your company. Or FAX QMS Product Information at **(205) 633-4866.**

POSTSCRIPT®

Features That Add Up To Lower Per-User Cost

- MIPS R3000 RISC-based internal controller for super-fast page processing
- 8 MB RAM standard, expandable to 16 MB
- 1.44 MB, 3 1/2" floppy drive to load fonts or emulations into RAM or onto hard disk
- QMS proprietary ASAP™ IV technology speeds PostScript processing time
- 20 pages per minute
- 70,000 plus page-per-month duty cycle
- 1500 sheet input and output capacity
- Letter-/A4-, legal, 11"x17"/A3- and executive-size printing capabilities
- Duplexing feature prints on both sides in one pass
- Easy-to-read, multilingual LCD front panel to easily configure printer
- Document handling features include tumble printing, collation, offset stacking and automatic jam recovery.

1-800-523-2696 EXT. 14

QMS™

Where Imagination Leads

The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, ASAP, and the QMS logo of QMS, Inc. Adobe and PostScript of Adobe Systems, Inc. EtherNet of Xerox Corp. IBM and Token Ring of International Business Machines Corp. AppleTalk, EtherTalk and Macintosh of Apple Computer, Inc. NetWare of Novell, Inc. DEC, DECnet, and LN03 of Digital Equipment Corp. HP, LaserJet, and HP-GL of Hewlett-Packard Company. Centronics of Centronics Data Computer Corp. Dataproducts of Dataproducts Corp.

† Contact QMS for availability of network options.

*Patent pending

CIRCLE NO. 68 ON INQUIRY CARD

AIX EXPO '91

RISC SYSTEM/6000 SOLUTIONS CONFERENCE

Monday, September 30th - Thursday, October 3rd, 1991
Santa Clara Convention Center, Santa Clara, California

"de facto capital of Silicon Valley"

The Event of the Year for AIX and the RISC System/6000

AIX EXPO '91 is "The Event" where IBM and solution vendors will be showcasing their products and services at booths with demonstrations in a 50,000 square foot exhibit area.

The comprehensive four-day **RISC System/6000 SOLUTIONS CONFERENCE** consisting of over forty seminars, tutorials, courses, workshops and sessions will feature:

- KEYNOTE ADDRESSES by IBM executives
- INDUSTRY PANELS including the popular *Ask IBM Forum*
- FULL-DAY SEMINARS AND TUTORIALS by the industry's AIX experts
- FOUR APPLICATION-SPECIFIC TRACKS in sessions presented by vendors and users
- "HANDS-ON" WORKSHOPS on systems running IBM and third-party applications

Specialized technical training courses conducted in a "classroom" environment using the RISC System/6000 will also be offered during AIX EXPO '91.

IBM is a registered trademark of International Business Machines Corporation. AIX EXPO '91, AIX, and RISC System/6000, are trademarks of International Business Machines Corporation. AIX EXPO '91, AIX, and RISC System/6000, are used by the International Technology Group and The Conference Group under license from International Business Machines Corporation.

Send Information about AIX EXPO '91:

❑ ATTENDING ❑ EXHIBITING

Name _____

Title _____

Company _____

Address/PO Box _____

City/State/Zip _____

Telephone _____ Facsimile _____

Mail to: The Conference Group, 700 Welch Road, Palo Alto, CA 94304, Tel. (415) 688-1265 or FAX (415) 327-8745

CIRCLE NO. 141 ON INQUIRY CARD

can be used in conjunction with Lex-WP. Prices start at $395. **Ace Microsystems Ltd., Charlotte House, 87 Little Ealing Lane, London W5 4EH, England; +44-81-579-5599 or 800-445-9292.**

Circle No. 317 On Inquiry Card

SOFTWARE APPLICATIONS

Is There UNIX in the House?

Soft Computer Consultants SoftLab II is an information management system for hospitals and clinical laboratories, designed to computerize all lab activities from order entry to result reporting. As a standalone system, the software can also connect to instruments in hematology, chemistry, and urology laboratories. Management modules include functions such as report generators, personnel scheduling, quality control reports, printing of daily logs, and other printing of reports.

Other modules include workload reports to track cost and frequency of selected hospital tests; users can define the number of statistical categories to track. Written in C and based on UNIX System V, SoftLab II can run on a variety of platforms. It is available as a turnkey system from SCC on the IBM RS/6000. Prices for the software range from $50,000 to $125,000. **SCC, 16723 Moorpark, Encino, CA 91436; 818-995-4832.**

Circle No. 318 On Inquiry Card

Present it in Pictures

Even as *UNIXWORLD* bemoaned the state of presentation graphics in UNIX, Silicon Graphics was preparing Iris Showcase, a drawing and presentation tool for its Iris 4D workstations.

The software allows users to create documents incorporating 2-D graphics and images; 3-D models; and text in multiple colors, fonts, and sizes. Documents can be viewed online, printed on a PostScript printer, or sent via e-mail. Showcase source code will also be available for software developers to incorporate into applications written for the Iris family. Written in C, the software can call UNIX and the Iris Graphics Library. Cost of Showcase software is $100, or $1,000 for source code. **Silicon Graphics, P.O. Box 7311, 2011 N. Shoreline Blvd., Mountain View, CA 94039; 800-345-0222 or 415-960-1980.**

Circle No. 319 On Inquiry Card

It's Done with Smoke and Mirrors

Smoke and Mirrors' Destiny software is a report publisher that, according to the company, combines the advantages of a UNIX 4GL report writer with desktop publishing capabilities. The result is the ability to produce reports, charts, and forms that incorporate multiple fonts, text processing, and drawing and graphing features.

With Destiny, users can work with the output of existing files or the actual data files themselves. The company says Destiny can also be incorporated by UNIX software developers into new or existing software packages. Price on ten platforms range from $500 to $25,000. **Smoke and Mirrors, 19 Columbia Ave., Takoma Park, MD 20912; 301-270-0343.**

Circle No. 321 On Inquiry Card

SOFTWARE DEVELOPMENT

When Kofax is Pitching

To help develop document image-processing applications for UNIX systems, Kofax Image Products has adapted its AT bus-based controller, the KF-8200 document processor, and created a Developer's Kit. The controller provides scanner and printer control with a high-speed video interface, and image compression and decompression. The Developers Kit incorporates a C programming interface, software drivers for the controller, and a device-driver interface. It also includes demonstration programs that serve as programming examples and diagnostic routines to aid in hardware debugging.

Kofax says that imaging applications developed under its DOS product will port easily to UNIX. Platforms initially supported include UNIX SVR3.2, SCO XENIX, and Sun. The software drivers support a wide range of scanners and laser printers. Price of the KF-8200 Developers Kit for UNIX is $695. **Kofax, 3 Jenner St., Irvine, CA 92718; 714-727-1733.**

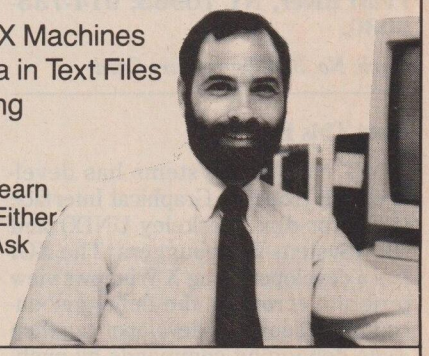
Circle No. 322 On Inquiry Card

continued

UNIX Accounting For Under $100

UNIX software doesn't have to be expensive to be good. ***Ray Swartz****, author of* ***"ANSWERS TO UNIX"****, has created a full featured general ledger bookkeeping system written entirely with Bourne Shell Scripts.*

- Easy to Use Menu Driven Design
- Full Source Code so You Can Customize Your System
- Portable Code for all UNIX Machines
- Easy Access to Your Data in Text Files
- A Training Tool for Learning Shell Programming



Use it to keep your books. Use it to learn shell programming from an expert. Either way, it's **only $79.95** plus shipping. Ask about our **limited time free offer.**

Call and get started today!

Berkeley Decision/Systems

803 Pine Street Santa Cruz, California 95062

Phone: (408) 458-9708 **FAX:** (408) 462-6355

CIRCLE NO. 87 ON INQUIRY CARD

Class Libraries Will Come to Order

Microtec Research's Capsule is a set of reusable C++ class libraries that software developers can use as object-oriented application building blocks. It's designed to furnish an infrastructure of objects that reduce design complexity and streamline the development process. In the library are C++ objects, or classes, that look like AT&T v2.1 C++ source modules. They incorporate the characteristics of object-oriented encapsulation, inheritance, and polymorphism.

Capsule includes base classes for implementing linked lists, circular lists, stacks, queues, keys, data and hash tables, binary trees, graphics, error detection, and registry. Capsule is licensed for a fee of $495 per CPU, with annual maintenance available for $250 per license. **Microtec Research, 2350 Mission College Blvd., Santa Clara, CA 95054; 800-950-5554 or 408-980-1300.**

Circle No. 323 On Inquiry Card

In Case of CASE, Use LAN

CGI's Systems' Paclan/X computer-aided software engineering (CASE) product targets software designers using a LAN for workgroup development of software. Residing on a server (currently, an HP 9000 Series 800), Paclan/X works with HP's LAN Manager for UNIX to communicate with designers using PCs running DOS or OS/2. Users call on the server as a shared repository of CASE information over the life of the development project. According to the company, with Paclan/X, Cobol systems can be generated for IBM, Bull, Unisys, DEC, and Tandem proprietary platforms. Price starts at $90,000 for up to twelve users. **CGI Systems, P.O. Box 1645, Pearl River, NY 10965; 914-735-5030.**

Circle No. 324 On Inquiry Card

Does This Bug You?

AT&T Network Systems has developed the Examine Graphical Interface (XGI) for dbx (Berkeley UNIX) and sdb (System V) debuggers. The XGI lets a developer using X Windows view program errors as the debugger encounters them. The developer can then issue debugging commands by pushing buttons rather than typing line commands. The interface shows a graphic display of breakpoints in the source code, so developers do not have to search for errors, and supports **vi** and **emacs**. The XGI supports dbx/dbx++ on Sun-3 and -4 workstations, and sdb/sdb++ on AT&T 3B2 and 386-based workstations. Cost is $795 per CPU; site licenses are available. **AT&T, 1 Speedwell Ave., Morristown, NJ 07960; 800-432-6600 or 508-960-1997.**

Circle No. 325 On Inquiry Card

Expert to the Core

Excel Software has combined a wide variety of CASE analysis tools on the Macintosh with its MacAnalyst/Expert software. According to Excel, developers can analyze their software's real-time capability, its conformance to object-orientation, and link the software to a database outlining the requirements to which the program is supposed to comply.

The real-time analysis models can create state-transition diagrams, decision tables, process-activation tables, and state-transition matrices. Target applications include embedded control systems, avionics, defense, and manufacturing equipment. For object-oriented applications, a front-end analysis tool incorporates data modeling of objects, attributes, and relationships; modeling of object lifecycles; process modeling of object services; and object communication diagrams. Running on Macintosh computers using A/UX 2.0, MacAnalyst Expert costs $1,595, with site licensing available. **Excel Software, P.O. Box 1414, Marshalltown, IA 50158; 515-752-5359.**

Circle No. 326 On Inquiry Card

STORAGE

The Next Eclipse

Peripheral manufacturer Microtech International has determined that bundled applications and systems software on the Next machine can take up as much of 70 percent of the space on the hard drive in the machine's basic configuration. In response, it has developed the Eclipse series of external hard drives for the Next workstation, ranging from 200 megabytes to one gigabyte ($1,899 to $5,399). Also available are a removable hard disk drive capable of holding a 50-megabyte cartridge for $1,399, and a CD-ROM drive for $1,099. Finally, single in-line memory modules are available in one- or four-megabyte sizes. **Microtech International, 158 Commerce St., E. Haven, CT 06512; 203-468-6223.**

Circle No. 327 On Inquiry Card

Your PC Plays Nine-Track

Overland Data's OD3210 is a nine-track tape storage device designed to fit on a desktop next to a PC. It supports 1600- and 3200-bits-per-inch operation and comes with a controller card, driver for UNIX and XENIX, and cable for connecting to the PC via the Pertec interface. Overland claims to have optimized the drive's tape tension capabilities to insure accurate reading and writing of data. The OD3210 incorporates a one-megabyte cache buffer as well. Cost is $4,995. **Overland Data, 5600 Kearny Mesa Rd., San Diego, CA 92111; 619-571-5555.**

Circle No. 328 On Inquiry Card

WORKSTATIONS AND SYSTEMS

The Status of Stratus

Stratus announced its XA/R Model 20, part of a new line of RISC-based fault-tolerant systems set to debut over the next two years, targeting online transaction processing, messaging, and message-switching applications. Besides UNIX SVR4, the XA/R Model 20 will also run Stratus proprietary VOS operating system.

Using Intel's 860 RISC processor, the XA/R Model 20 runs at 40 mips, and is compatible with Stratus' XA2000 systems using Motorola's 68030 processors. Stratus claims that applications currently running on the XA2000 line under FTX, its version of UNIX, will run without reprogramming on the new line of machines.

The XA/R Model 20, redundantly configured, can provide up to 96 megabytes of duplexed memory, seven gigabytes of disk storage, duplexed power supplies, and cartridge, reel-to-reel, or 3480-compatible tape drives. Prices start at $247,000. **Stratus Computer, 55 Fairbanks Blvd., Marlboro, MA 01752; 508-460-2000.**

Circle No. 330 On Inquiry Card

Hardware and Software Support

To **Altos System 4000**: Facts Software's Unifacts accounting software (+44-23-421-8191).

To **CMC Rockwell's FDDI adapters**:

New From Data Communications and Northeast Consulting Resources...

The Internetwork Decade: A Guide for Managing Crisis and Opportunity in the New Age of Corporate Networking.

In a landmark network industry report, experts Nick Lippis and Jim Herman of Northeast Consulting Resources, Inc., tell the story of the technological upheaval facing users, major systems vendors, and manufacturers of routers, bridges, T1 multiplexers, packet switches, LAN hardware and software, and carriers.

"A major new networking paradigm has emerged. An interconnection model so powerful, it will entirely transform the face of networking before the decade is done."

— Nick Lippis and Jim Herman
Northeast Consulting Resources, Inc.

In it, you'll get the answers that your professional survival depends upon, as these experts define and explain the wide- and local-area, and public and private aspects of the internetwork phenomena, including:

- the most viable architecture for future corporate networks
- how long it will take for the industry to correct deficiencies in routing protocols, congestion control, load balancing, security, accounting, and network design tools
- who's controlling the development of commercial internet standards – the research community, or a small group of relatively new vendors
- and more!

The difference between success and failure in this new decade is knowledge. And at *only $1,500,* **The Internetwork Decade: A Guide for Managing Crisis and Opportunity in the New Age of Corporate Networking** is exactly what you need — a comprehensive blueprint for corporate network design and marketing strategy for the '90s.

So order yours today.

Order 2 or more copies — pay full price for the first and just $99 for each additional copy. To order now, **call 212-512-3149** or mail back the coupon below. Or you can order by **FAX** by copying the coupon and faxing it to Brunny Ayala at Data Communications, at: **212-512-6590.**

Place your order today!

☐ **YES.** I want to stay up-to-date on the latest networking technology. Please send me ___ copy(s) of **The Internetwork Decade: A Guide for Managing Crisis and Opportunity in the New Age of Corporate Networking.**
Item # 00075

Order by March 15, 1991 and receive a 5% discount.

☐ A check of $_____ is enclosed (please include $2.50 for shipping and handling).

☐ Please charge my: ☐ American Express ☐ MasterCard ☐ Visa

Card # _____ Expiration Date _____

Signature _____

Mail or fax coupon to:
Brunny Ayala, Data Communications, 41st Floor, 1221 Avenue of the Americas, New York, N.Y. 10020

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone _____ Fax _____

software that supports both simple network management protocol (SNMP) and FDDI's SMT (station management) physical media schemes (805-968-4262).

To **Data General Aviion**: Oasys' Green Hills C++ native and cross compiler (617-862-2002).

To **DEC DECstations**: Ace Microsystems' Lex-WP word processing and database software (+44-81-579-5599 or 800-445-9292); Control Data's EDL v.5 networked information management software (800-888-1967 or 612-853-8100); Ready Systems' VRTXvelocity development environment for real-time applications (408-736-2600).

To FPS Computing Model 500 supercomputer: Multipath's Fast Matrix Solver Library of matrix algebra operations (805-962-4464); New England Software's Hintz Matrix Solver for symmetric and non-symmetric applications, and Sparqs Sparse Matrix Quick Solver for 3-D finite element and finite difference applications (617-894-2451); and SAIC's ACAL algorithms for more efficient processing of complex elements (619-546-6546).

To **HP 9000 Series 700**: Cadshare Resources' Decade-UX computer-aided design (CAD) software (800-633-7644 or 704-845-2845).

To **IBM RS/6000**: Cadshare Resources' Decade-UX CAD software (800-633-7644 or 704-845-2845); Control Data's EDL v.5 networked information management software (800-888-1967 or 612-853-8100); Epic Software's EIS-Epic executive information system software (617-270-0610); Language Processors' PL/I compiler and CodeWatch debugger (508-626-0006); MDB's DataShuttle removable disk drive (714-998-6900); Sybase Net-Gateway for communication between IBM mainframes and LANs (415-596-3500).

To **Motorola MultiPersonal Computer**: Wollongong Group's Management Station SNMP-based network management software (415-962-7100).

To **Next**: Insignia Solutions' SoftPC 2.0 DOS emulation (415-694-7600).

To **SCO UNIX**: DIST's Down To Earth accounting, distribution and manufacturing software (916-635-7300); Epic Software's EIS-Epic executive information system software (617-270-0610).

To **Silicon Graphics**: Control Data's EDL v.5 networked information management software (800-888-1967 or 612-853-8100).

To **Sony News 3250 laptop**: Cadshare Resources' Decade-UX CAD software (800-633-7644 or 704-845-2845).

To **Star 910/VP supercomputer**: Applied Information Systems Xess engineering spreadsheet (919-942-7801).

To **Sun SPARCstation**: Epic Software's EIS-Epic executive information system software (617-270-0610); Intergraph's Engineering Modeling System and MicroStation CAD software (205-730-8302); MCBA's Classic accounting, distribution, and manufacturing software (818-242-9600); Sybase Net-Gateway for communication between IBM mainframes and LANs (415-596-3500); X Solutions' Archium document storage and management software (44-81-655-3414).

To **Sun-3 and -4**: Control Data's EDL v.5 networked information management software (800-888-1967 or 612-853-8100).

Hardware Upgrades

Solbourne Computer offers an accelerated color frame buffer, the SGA20, for its S4000 workstation (303-772-3400).

Software Upgrades

Cleo Communications adds remote capabilities to its 3270 Linkix emulation software, so that up to 254 simultaneous mainframe sessions can be accessed from remote systems through a synchronous interface board (313-662-2002).

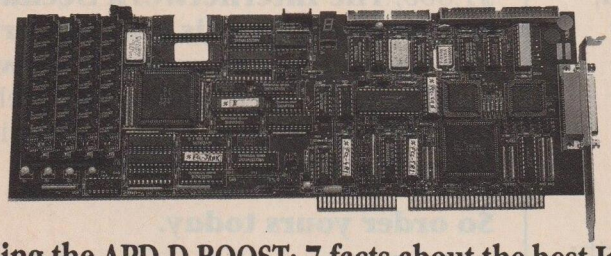
Data General adds C2- and B1-level security, as well as symmetric multiprocessing capability to its DG/UX 5.4 for Aviion systems (508-898-4660).

Information Presentation Technologies enhances its uShare Macintosh-Sun connectivity software by adding transparent access to network services such as file sharing, print spooling, e-mail, and terminal emulation (818-347-7791).

Raima adds the ability to open, access, and close databases even when the operating system doesn't allow multitasking applications with db_Vista III v3.20 for UNIX developers (206-747-5570).

Vital Images enhances its VoxelView visualization software by combining geometric graphics and volume rendering in VoxelView/Ultra (515-472-7726).

continued



Introducing the APD D_BOOST: 7 facts about the best Intelligent Disk Channel.

1. BEST PERFORMANCE AVAILABLE. The best performance available for ISA Bus: up to 1,8 times faster than DPT model DM 3011/75 (*), and the best performance among SCSI disk intelligent channels: up to 2 times faster than PSI. hyperstore 816/1600.

2. STATE OF THE ART. Optimized R/W algorythm: Read Look Ahead and Delayed Write mechanisms. 32 bits dedicated processor.

3. COMPATIBLE PERFORMANCE. Maximun performance in full WD 1003/1007 compatible operation mode. No special drivers or adittional software required.

4. STANDARD COMPONENTS. o,5 to 16 MB. cache memory in 4 SIMM modules (256 Kb. x 9, 1 Mb. x 9,4 Mb. x 9).

5. REDUCED SIZE. Full AT size , fits on a single AT slot (with 16 MB of memory).

6. MATCHING ALL NEEDS. UNIX V, XENIX, MS-DOS, THEOS, PICK, PROLOGUE, all the O.S. can benefit from APD D_BOOST.

7. BEST PRICES IN ALL CONFIGURATIONS. From 749$ in basic configuration (0'5 MB. RAM) to 2.749 $ (16 MB. RAM).

Payment by.Visa/ American Express.

(*) Benchmark used: 10 sort processes on 1 file of 2.5 MB.Writing the output in 10 differents files.

APD C/ Castelló, 63. 28001. Madrid. Spain. Or fax to Peter Howarth. Fax nº.: 34- 1- 571 88 16.

AT, UNIX , XENIX, MS-DOS, THEOS, PICK, PROLOGUE, are trade marks of their respectives companies. APD D_BOOST is registered of APD SA.

CIRCLE NO. 195 ON INQUIRY CARD

Call For Nominations

International Award For Excellence In Open Systems

In recognition of those innovative pioneers who are making the dream of open systems a reality, **UNIX EXPO INTERNATIONAL** has created the first annual **International Award For Excellence In Open Systems.**

To be presented at **UNIX EXPO INTERNATIONAL** in New York, the highly prestigious award will honor a trailblazing end user organization or individual for innovation in the development and implementation of open systems in a business environment.

This is your opportunity to gain unprecedented recognition for your organization, colleagues or associates who, in your opinion, are true open systems pioneers.

To receive your official nominating form and additional information on the award, call Gary Donnelly, Chairman of the Award Selection Committee, at Donnelly & Associates, 703-758-1018, fax 703-391-6881.

Award Selection Committee Members: Mike Azzara, UNIX Today!; Peter Bartolik, COMPUTERWORLD; David Brousell, DATAMATION; Gary Donnelly, DONNELLY & ASSOCIATES; Lincoln Faurer, CORPORATION FOR OPEN SYSTEMS; Dave Flack, UNIX WORLD; Pamela Gray, MIGRATION TECHNOLOGY; J.D. Hildebrand, UNIX REVIEW; Bud Huber, HUGHES AIRCRAFT; Richard Kuzmack, U.S. OFFICE OF MANAGEMENT AND BUDGET; Nina Lytton, OPEN SYSTEMS ADVISOR; Geoff Morris, X/OPEN; Neal Nelson, NEAL NELSON & ASSOCIATES; Mike Plouffe, TRANSPORT CANADA; Ira Sager, COMPUTER SYSTEMS NEWS; Nick Walker, UNIX SYSTEMS.

SPONSORED BY UNIXEXPO INTERNATIONAL

For more information on UNIX EXPO INTERNATIONAL which runs Oct. 30-Nov. 1, 1991 in New York's Jacob K. Javits Convention Center, contact National Blenheim Expositions at 15 West 39th Street, New York, N.Y. 10018 USA, Telephone: 212-391-9111, Fax: 212-819-0755.

CIRCLE NO. 188 ON INQUIRY CARD

SYSTEMS ANALYSIS, SOFTWARE ENGINEERING, OR COMPUTER PROGRAMMING

Now! NRI training assures your success in three of today's fastest growing computer fields

These days, success comes to those who know how to get the most from a computer. People who know how to analyze systems, design and develop software to meet specific needs, program in the languages that will get the job done.

Now NRI has the training you need to get a competitive advantage in today's rapidly expanding computer world. Choose from NRI at-home training in PC Systems Analysis, PC Software Engineering Using C, or Computer Programming...and get the computer, the software, and the hands-on skills you need for advancement, a new career, or a business of your own.

1. Learn the art of systems analysis and get ahead in today's competitive business world

The name of the game in business today is setting up systems that will increase efficiency, productivity, and profits—using a computer both as the analysis tool and the ultimate system solution.

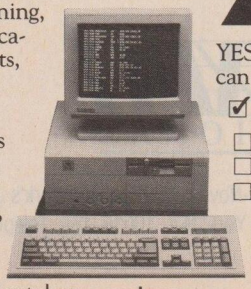
Now, NRI's new at-home training in PC Systems Analysis gives you the computer, the software, and the analytical skills to perform this vital role for any size business.

Step by step, you learn the art of systems analysis: how to define and break down the problem, interview users, interpret and model data, prepare proposals—every skill you need to map out the optimal system solution. But that's just the beginning.

Training includes a powerful computer system and software you keep

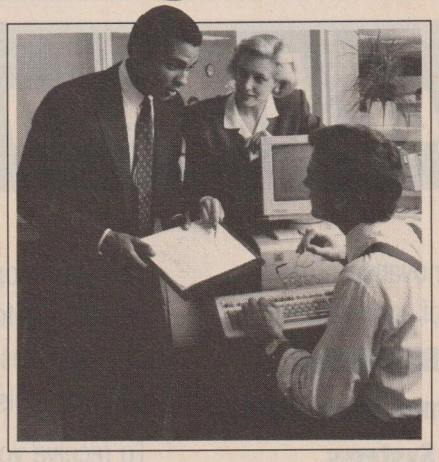
NRI gives you hands-on experience with an AT-compatible computer system—complete with 1.2 meg floppy drive, monitor, modem, and a full meg of RAM—all yours to train with and keep!

You begin by learning BASIC, today's most popular PC programming language. Then, using the Microsoft® Works software also included in your training, you master four essential PC applications: word processing, spreadsheets, database management, and data communications.



Soon your computer becomes your most important analysis tool, allowing you to produce cost-benefit analyses, feasibility studies, long-range projections, complex databases, and more.

Send today for your free NRI catalog, and discover how NRI's new training can make you a key player on any business team.



2. Build your own software as you build a money-making career with NRI's new training in PC Software Engineering Using C

Jobs in developing custom software will boom in the 1990's, according to the Bureau of Labor Statistics—up from about 500,000 positions in 1986 to over 1.2 million by the year 2000. Now you can get in on the rapid growth of this multibillion dollar industry with NRI's new training in PC Software Engineering Using C.

Train with Borland C++® and a powerful AT-compatible computer

Your NRI training gives you hands-on experience with a powerful IBM PC/AT-compatible computer system, including 2400 baud internal modem, 30 meg hard drive, VGA color monitor, and advanced programming software—Borland's Turbo C++.

You learn software engineering from start to finish, mastering each of the essential phases involved in developing a full range of applications. From analysis to design to advanced programming in C, you're in command as you assemble the building blocks for success as a software engineer. Send for your free NRI catalog today!

3. Begin a high-paying career—even a business of your own—in computer programming

Now, with NRI training in Computer Programming, you can give computers the power to carry out an astonishing range of business, professional, and personal applications. Because only NRI gives you hands-on programming experience with a powerful AT-compatible computer, plus training in four of today's hottest computer languages—BASIC, Pascal, C, and COBOL.

NRI gives you everything you need to succeed in programming, today's top-growth computer career field

Your NRI lessons first guide you step by step through the fundamentals, giving you a clear understanding of the programming design techniques used every day by successful micro and mainframe programmers. Then the fun really begins.

With your personal NRI instructor always available to help, you use your computer and software to actually design, code, run, debug, and document programs in BASIC, Pascal, C, and COBOL.

Discover how NRI gives you the experience and the know-how, the computer and the software to advance on the job or build a money-making business of your own in your choice of today's top computer fields. Send for your free catalog today!

If the coupon is missing, write to NRI Schools, McGraw-Hill Continuing Education Center, 4401 Connecticut Avenue, NW, Washington, DC 20008.

IBM is a registered trademark of IBM Corporation

SEND COUPON TODAY FOR FREE NRI CATALOG

NRI Schools
McGraw-Hill Continuing Education Center
4401 Connecticut Avenue, NW
Washington, DC 20008

YES! Send me the free catalog I've checked and show me how NRI can give me the state-of-the-art computer training I need for success.

☑ Check one free catalog only

- ☐ **PC Systems Analysis**
- ☐ **PC Software Engineering Using C**
- ☐ **Computer Programming**

Other computer career training:

- ☐ Microcomputer Servicing
- ☐ Desktop Publishing and Design
- ☐ Word Processing Home Business

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

Accredited Member, National Home Study Council

4565-031

Compilers

To **C++**: Oasys' Green Hills C++ compiler is now source-code compatible with AT&T C++ v2.1 (617-862-2002).

Product Line Extensions

To **Alliant**: the FX/800, an entry-level addition to its FX/2800 Intel 860-based supercomputer family, supporting two to eight processors, with prices starting at $189,000 (508-486-4950).

To **AT&T**: the 750CX 17-inch, 256-color X terminal, starting from $4,995, and the 730X 16-inch monochrome X terminal, starting from $2,495 (800-828-8649 or 919-855-2737).

To **Control Data**: the MIPS R3000-based 4360-300 multiuser server, priced from $60,550 (800-888-1967 or 612-853-8100).

To **Corollary**: the 8x4GT multiport subsystem for UNIX-based PCs, with a 25-MHz 286 processor and support for up to 32 RS-232 connections, quantity-one priced at $895 (714-250-4040).

To **DECsystem 5500**: a 19-inch-wide rack-mounted version of the RISC-based server, priced at $43,100 (508-351-4401).

To **Elgar**: the IPS 1200 uninterruptible power supply for SCO UNIX and XENIX, priced at $1,299 (619-450-0085).

To **Microcom**: the HDMS Plus dial-up modem network management system, with "threshold processing" for administrators to set conditions for alarms and messages, priced from $750 to $1,300 per port, or $1,099 for a single chassis (617-551-1000).

To **Mt Xinu**: the binary version of its Mach 386 operating system for 386-based PCs running UNIX to complement its source code version; binary version is $1,395, or $1,995 with X Windows, networking, and online documentation (415-644-0146).

To **NCD**: the NCD14c, 14-inch color X terminal with 1024-by-768 resolution, priced at $3,000 (415-694-0650).

To **Solbourne**: the Series 5E/800i network server, supporting up to four 40-MHz CPUs and incorporating intelligent interface disks, starting at $74,900 (303-772-3400).

To **Sony**: the News 3879 workstation server, with a 1.3-gigabyte hard disk and 64 megabytes of RAM, priced from $35,000 (408-434-6644).

To **Storage Dimensions**: a 650-megabyte, 5 1/4-inch erasable optical subsystem for PC-based UNIX and XENIX systems, priced at $5,495 (408-879-9330).

To **Tektronix**: the TekXpress XP21 17-inch monochrome X terminal, priced at $2,995 (800-225-5434 or 503-620-9100).

To **Texas Instruments**: the TI 1507, a 68040-based UNIX workstation, priced from $18,000 (800-527-3500 or 817-774-6252).

To **Visual Technology**: the X-19PQD imaging display station, with 1280-by-1024 resolution, incorporating a Motorola 16-MHz 68020 processor and a TI 32-MHz 34020 graphics coprocessor, expandable to 26 megabytes of RAM, priced from $4,495 (508-836-4400).

To **Xyplex**: the MaxServer 6020 remote multiprotocol bridge, compatible with Vitalink's remote bridges and routers, priced at $4,495 (508-264-9900). ■

DON'T FORGET TO WRITE!

Are You Moving?

Please let us know
so we may continue your subscription.
Affix your former address label here.

☐ I have moved. Please change my address as indicated below.
☐ Please renew my *UNIXWORLD* subscription for another year at $18 U.S.A. (Canada $24 U.S. funds; other foreign residents $38 U.S. funds).
☐ I would like to become a subscriber for one year (12 issues) at $18 basic rate.

Name (please print)

Title

Company Name

Address ☐ Home ☐ Office

City State Zip

Please complete all questions to qualify for the rates shown above. Subscriptions at the above rates are limited to persons with active professional, functional, and managerial responsibilities in UNIX or XENIX computing. Other subscribers $36 a year in U.S., Canada $48. Other Foreign $76.

Circle one only

My company's Primary Business

a. Mfg. of Comp., Comp. Equip.
b. Mfg. (except Comp./Comp. Equip.)
c. Systems Integrator/House
d. Software Developer
e. VAR, Dealer or Distributor
f. Communications/Telephone
g. Transportation/Utilities
h. Mining or Construction
i. Fin./Ins./Real Estate
j. Whlse. or Retail Trade
k. Consulting
l. Government or Military
m. School or University
n. Other: _____
o. Medical/Dental/Legal
p. Research/Development

Circle one only

My Primary Job Function

a. Corp. or Fin. Mgmt.
b. MIS/DP Mgmt.
c. Office Mgmt./Admin.
d. Telecommunications
e. Systems Integration
f. Design or Dev. Eng.
g. Prog./Software Dev.
h. Research/Analysis
i. Marketing or Sales
j. Purchasing
k. Mfg./Production
l. Distribution
m. Education/Teaching
n. Consulting
o. Gov./Public Amin.
p. Other: _____
q. Technical Staff/Engineering Support

MAIL TO:

UNIXWORLD

SUBSCRIPTION SERVICES
P.O. BOX 571
HIGHTSTOWN, NJ 08520-9330

MULTIFLOW– Unix SuperComputers for sale! We are the exclusive sales agent for Multiflow SuperComputers. >50mips, up to 20 gig of disk & 512mg mem; s w includes 4.3 Berkeley, C, Fortran, Vax (EDT, VCL, Decnet) NFS, OSF-Motif, X-Wind. rev-4 & more. Great prices & service support by Bell Atlantic Business Systems Services. Call Steve at 203-488-5377.

UNIX-ANYWHERE. Security. Remote Support. Monitoring. SCO XENIX-386/UNIX. $95. Dealer Inquiries Invited. Call 615-626-3940. 69-5 ET M-F.

Looking for
Tutorials and Product Reviews
See our cumulative index
Call or write to:
UNIX WORLD
444 Castro St. Mountain View, CA 94041 (415) 940-1500

Boxtops™ Bisync

2780/3780 RJE Emulation

"As easy as ATDT"

- Host-based power & flexibility in a stand-alone unit.
- Protocol options configured with AT-style commands.
- Speeds to 38,400 baud.

Starburst Data Systems, Inc.
20416 87th Ave. SW
Vashon, WA 98070
(206) 463-5456

CIRCLE NO. 110 ON INQUIRY CARD

AT&T COMPUTER USERS

CS COMPREHENSIVE SYSTEMS

We Feature (New & Used):

- **EXB-8200CS 2.3 Gigabyte Tape units for 3B2/6386/486 StarServer**
- **AT&T Memory Boards for 3B2/6386 20/25/33**
- **AT&T computers–3B2/6386/486 StarServer w/UNIX System V Release 4.0**
- **Wide selection of SCSI/ESDI Disk Modules/ peripherals for 3B2/6386/486 StarServer**
- **Informix & FourGen Software Specialists**

Call or write for technical specifications and pricing:

COMPREHENSIVE SYSTEMS
Airport Executive Tower 2
7270 N. W. 12th Street, Suite 500
Miami, Florida 33126
FLA. 305-599-9992 • 800-445-UNIX
FAX: 305-594-5652

CIRCLE NO. 7 ON INQUIRY CARD

Get Graphic.

Silicon Graphics is creating new dimensions in Project SuperComputing, Visual Simulation, MultiMedia, Animation, Scientific Visualization, Molecular Modeling, Computational Fluid Dynamics, and Beyond..!

Our systems are the world's most powerful tool for making ideas tangible. Multidimensional, interactive, animated images for every creative and analytical field.

Do you work with an open mind, at a fast pace, and thrive on seeing a brainchild come to life? If so, send us your resume today. And make your career a graphic example of success.

SYSTEMS SOFTWARE ENGINEERS

Exciting positions are now available in our Applications Support Group. Successful candidates will provide technical support for strategic third party software vendors. Requirements include proficiency with UNIX®, 3D graphics, X Windows and parallel processing concepts; a BS/MS in Computer Science and/or Engineering; and 3-5 years of software development experience. Experience in large scale UNIX application development environments is a plus. Strong interpersonal skills are essential, as many tasks will be performed on-site with software vendors.

Silicon Graphics offers an attractive salary and benefits package. Please send your resume to our corporate headquarters, Silicon Graphics, Inc., Professional Staffing, Job #T-244, P.O. Box 7311, Mountain View, CA 94039-7311. Principals only, please. We are proud to be an equal opportunity employer. UNIX is a registered trademark of AT&T.

SiliconGraphics
Computer Systems

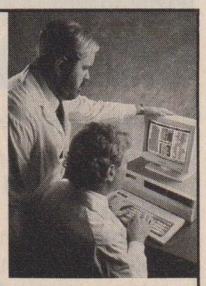
UNIXWORLD Marketplace

Gain exposure and generate highly qualified sales leads from people interested in your products/services.

For More Information Contact:

David E. Pearson
415-940-1500

Ontrack Data Recovery



For that critical moment when only the best will do . . .

- 95% Success Rate
- Fast Turn Around
- Expertise with Unix, Xenix, Novell, DOS, Macintosh, OS/2, Bernoulli, Sun and more!
- Priority Service Available

1-800-872-2599
612-937-5161
Fax: 612-937-5750

Ontrack DATA RECOVERY

CIRCLE NO. 15 ON INQUIRY CARD

FEITH TinyTape
– 2.3 gigabytes of unattended backup using standard 8 mm cartridge tapes
– Includes FEITH Hi-Speed Backup Software

FEITH TinyTape DAT
– 1.3 and 3.0 gibabytes of unattended backup using DAT cassette tapes

FEITH BigBoy Disks
– 312, 663 1024MB formatted
Optional disk controllers with up to 8MB of cache

FEITH BigBoy Optical Disks
– 940 MB and 6.5 GB WORM
– 600 MB and 1.0 GB Erasable Optical

Works with all AT&T 3B2, 6386, Starserver, and 7000 computers

FEITH SYSTEMS AND SOFTWARE, INC.
425 Maryland Drive
Fort Washington, PA 19034
Voice: (215) 646-8000 FAX: (215) 540-5495
EMAIL: attmail!dfeith
TinyTape and BigBoy are trademarks of Feith Systems and Software, Inc.

CIRCLE NO. 121 ON INQUIRY CARD

BUG TRACKING

Distributed, Submit Bugs Anywhere Worldwide

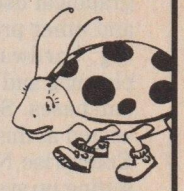
Configurable TTY Screens

User Tailored Management Reports and QA Metrics

No Training Required

Secure Dialin Module

Hardware and Software Defect Tracking



QualTrak Corporation
San Jose, California
(408) 274-8867 Fax (408) 274-0231

CIRCLE NO. 70 ON INQUIRY CARD

INFORMIX®

Solutions from the Database through the Desktop

INFORMIX outstanding line of information management software products is available from Western Pacific Data Systems to resellers and VAR's for the IBM®, RISC System/6000™, Texas Instruments, Wyse, SCO Unix, NEC, and Altos.

Call Today to Order:

- INFORMIX-OnLine
- INFORMIX-SE
- INFORMIX-4GL
- INFORMIX-4GL ID
- INFORMIX-4GL RDS
- INFORMIX-SQL
- INFORMIX-ESQL
- INFORMIX-NET
- INFORMIX-STAR
- INFORMIX-QuickStep®
- C-ISAM®

Western Pacific Data Systems, a leading distributor, offers total service for INFORMIX software including sales, installation, and support.

Western Pacific Data Systems
7373 Engineer Road
San Diego, CA 92111

WPDS, an Authorized Distributor for INFORMIX.

1-800-367-9737

CIRCLE NO. 48 ON INQUIRY CARD

Consulting Opportunities

CONTRACTS OR PERMANENT

Programmers, Designers, Analysts, DBA's, Technical Writers, System Analysts, Administrators, Engineers sought for per diem and permanent positions:

UNIX/C

- AIX
- XWINDOWS
- MOTIF
- KERNEL
- ORACLE
- DATA COMMUNICATIONS
- TCP/IP
- RADIO FREQUENCY
- DIAGNOSTICS
- TESTING

Other positions also available.
Please call or send resumes to:

Structured Logic Systems, Inc.
Two Penn Plaza, Suite 1540, New York, NY 10121
212/947-7510 FAX: 212/947-9338
1-800-537-1132
Must Have Minimum Two Years Experience.
NY • NJ • DC • FL • TX • CA • GA

CIRCLE NO. 242 ON INQUIRY CARD

Revolutionary Graphics-Based BBS Software

COCONET®

Supports real EGA, VGA, and Hercules graphics as well as ASCII text. Ideal for running online information services or customer tech support BBS's. Requires UNIX/XENIX System V 386. 4-1000+ users. CocoTalk API C Library available for developing custom applications.

Call Coconut Computing for more info!

COCONUT computing, inc
Voice: 619.456.2002
BBS: 619.456.0815
(7-E-1, 1200/2400)

COCONET is a registered trademark and CocoTalk and Coconut are trademarks of Coconut Computing, Inc.

CIRCLE NO. 72 ON INQUIRY CARD

X.25 SDLC
QLLC HDLC
ADCCP PAD

- C source code
- ROM-able
- Full porting provided
- No OS required

GCOM, Inc.
1776 E. Washington
Urbana, IL 61801
(217) 337-4471

Specialists in Computer Communications
FAX 217-337-4470

CIRCLE NO. 38 ON INQUIRY CARD

X, XLIB & OSF/MOTIF TRAINING

7th National Tour
Lecture and Lab Courses

- Boston
- Chicago
- Dallas
- Houston
- Newark
- San Jose
- Washington D.C.

Hands On Learning Corporation
27 Cambridge Street
Burlington, MA 01803
Phone: (617) 272-0088
Fax: (617) 272-3667

CIRCLE NO. 197 ON INQUIRY CARD

MODEM SECURITY

Software Dialback
Dialin and Dialback Passwords
UUCP Dialback too

Terminal Monitoring
Watch and log all terminal I/O anytime

Protocol Support
Full login, telnet and Hayes protocol support

Unlimited number of users and modem lines
Modem billing and usage reports
Multiple logins per dialin

QualTrak Corporation (408) 274-8867
San Jose, California Fax (408) 274-0231

CIRCLE NO. 75 ON INQUIRY CARD

continued from page 151

NETCOM '91: June 11-14
Billed as "The Network Computing Symposium," NETCOM is a tutorial/conference program targeted to managerial-level personnel within the corporate computing environment who are concerned with the strategic, managerial, and productivity aspects of networks.

Topics of tutorials and information sessions include: the integration of DOS and UNIX, and UNIX with Sun; graphical user interfaces, groupware, and other productivity tools; networking; hardware issues; management planning and strategies; and distributed databases. Several tracks will be presented at this conference, including an Enterprise Network track focused on setting up systems.

The conference will be held at the Holiday Inn Crowne Plaza at National Airport, Arlington, Va. Contact Wilma A. Hurwitz, Technology Transfer Institute, 213-394-8305.

PC Expo in New York: June 25-27
This ninth annual event is a computer trade show and conference for corporate volume buyers and trade resellers.

Keynote speaker, Ray Noorda, the president, CEO, and chairman of Novell, will address "The Past, Present, and Future of Network Computing." Noorda will receive the PC Expo Industry Leader Award during the show.

Conference tracks will cover topics suggested by buyers and resellers and include introductory-level primer sessions, as well as those focused on software, hardware, trends, management, connectivity, and windows. Specific issues scheduled for discussion are hardware options, the future of DOS, trends in operating system platforms, UNIX as a base for corporate applications, and interoperability.

More than 700 exhibitors are scheduled to take part in the trade show portion of the event. The conference will be held at the Jacob Javits Convention Center, New York, N.Y. Contact Annie Z. Scully or Mark A. Haviland, Bruno Blenheim Inc, 800-444-3976 or 201-569-8542. ■

NEXT MONTH IN UNIXWORLD

Eliminating the Paper Chase

If you've got more paper, documents, and images than you can handle, consider imaging technology. With scanners and optical disks, you can search for, retrieve, manipulate, and print out any images from your system.

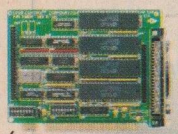
Informix's Roger Sippl

Before he founded Informix, Roger Sippl faced cancer and defeated it. See how this battle shaped the rest of his life.

Taking the SBus

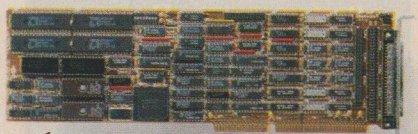
Riding the SBus means making sure your SBus board doesn't make a SPARC spark. When buying a board-level product for a SPARCstation or compatible, make sure it works for you.

Multiple-Choice



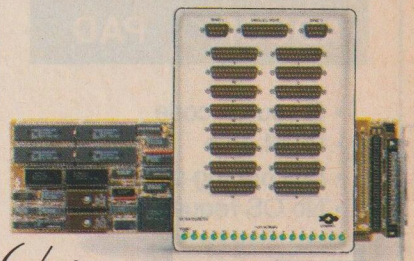
4-8

Our Hostess multiuser serial controllers are an excellent choice for up to eight occasional users. The Hostess *550* provides buffering for even higher performance. And for truly high performance, choose the Hostess *i*.



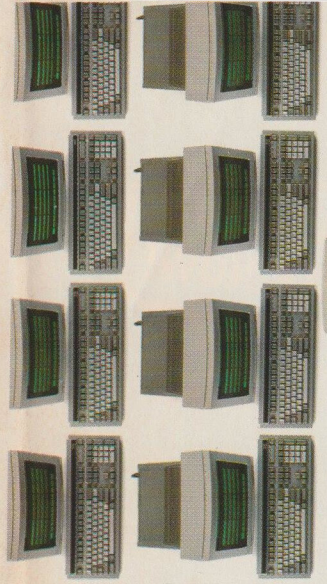
16

Expand up to 16 users with the Hostess *i* high performance intelligent serial controller. But if your multiuser requirements are more modest a 16 port Hostess *550* controller makes an equally intelligent choice.

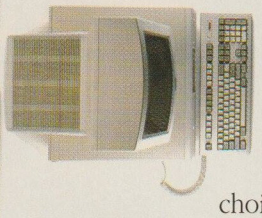


64+

Our Hostess *i* gives you the flexibility and power for virtually limitless growth. Starting with an 8 port base board, you can expand 16 users at a time, while maintaining current levels of performance every step of the way.



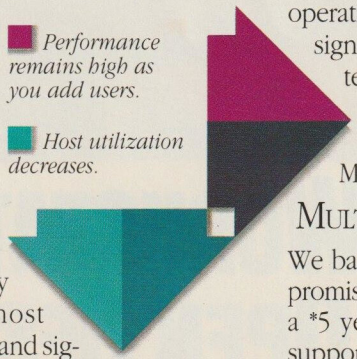
Multiply Your Choices

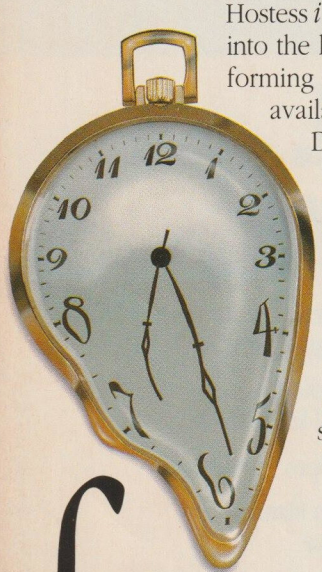


At Comtrol we pioneered multiuser technology. And we know that there are no single solutions to multiuser environments. That's why we offer more choices than any other company...from text to graphics...for modest users to over 64 users supported by a single PC. And we've not only multiplied your choices, we've multiplied performance, allowing you to expand without the high cost of adding computers.

Multiplied Performance

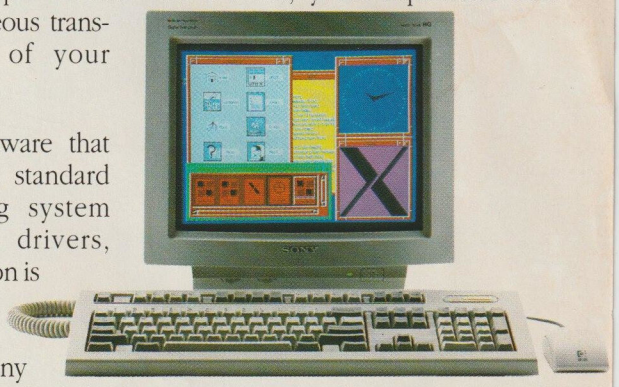
No company offers you more performance than Comtrol. In fact, our new DT *Express* driver transforms our Hostess *i* controllers into the highest performing controllers available today. DT *Express* dramatically reduces host utlilization and significantly increases throughput by managing all data transmission and data transform functions on the controller. So now as you add users, no one gets caught in a wait state.





MultiVision. For Choices Beyond Words

When graphics enter the equation, MultiVision enters the picture. A fully functional multiuser system for up to 16 users, MultiVision speeds images to the screen at a blistering 100 megabits per second. As a result, you'll experience near instantaneous transmission of your graphics.



With software that enhances standard operating system graphics drivers, MultiVision is compatible with virtually any monitor, keyboard, mouse or VGA controller supported by the operating system. MultiVision can also run applications designed for the "X" environment. But unlike a LAN-based "X" terminal, MultiVision is a multiuser system that transfers data up to 100 times faster. When you compare that performance with the cost of an "X" terminal... MultiVision's advantages really compute.

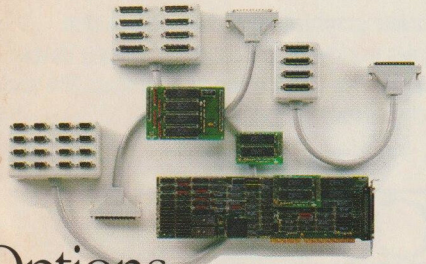
Multiplied Protection

We back our products with an uncompromising 30-day satisfaction guarantee, a *5 year warranty, complete technical support, and most importantly...a company that's easy to do business with. It all adds up to the best protection plan available. And if you're a VAR, call us about our Reseller Program that provides you with options designed exclusively for your needs.

30/5

*1 yr. MultiVision

for Multi-Users.



Options

Our products offer serial port and memory options that are field upgradable; compatibility with ISA (AT), MicroChannel and EISA buses; RS232, 422, 485 and Current Loop interfaces and DB 9, DB 25 and RJ 45 connectors.

Graphics

When your needs move beyond text, MultiVision moves into view–a high speed (100 megabits per second) communications controller that offers near instantaneous multiuser graphics like you've never seen before.

CIRCLE NO. 149 ON INQUIRY CARD

Comtrol®

A Control Systems Company

Multiply your choices. Call Comtrol today.

1-800-926-6876

Comtrol Corp., 2675 Patton Road, P.O. Box 64750 St. Paul, MN 55164
612/631-7654 FAX 612/631-8117

Comtrol Europe LTD., Kille House, Chinnor Road, Thame, Oxfordshire, England
OX9 3NU, TEL 44 (0)844 261634, FAX 44 (0)844 261227

Comtrol France 19 Avenue de Norvège, 91940 Les Ulis, France
TEL (33 1) 69 28 34 00 - FAX (33 1) 69 29 00 20

© 1990 COMTROL CORPORATION. All rights reserved. All other brand names and product names are trademarks or registered trademarks of their respective holders.

INSTANT WORKSTATION. JUST ADD OPEN DESKTOP.

Take a look at the vast majority of graphical workstations developed over the past decade and you'll see something they all have in common:

An integrated UNIX® System environment.

Now take a look at the vast majority of businesses that have put computing power directly onto their office desktops over the past decade, and you'll see something they all have in common:

Industry-standard personal computers.

It doesn't take a computer to forecast the platform that's going to put graphical workstations on the vast majority of business and engineering desktops in the next decade:

An integrated UNIX System environment for industry-standard personal computers.

And that's what Open Desktop® is all about.

Open Desktop is the complete graphical operating system that's built on the most popular UNIX System platform of all time—SCO®. And it lets you create your own networked, icon-driven workstation environment using the industry-standard 386 or 486 computers and peripherals of your choice.

In a single, easy-to-use, fully supported—and completely integrated—package, Open Desktop delivers:

- the full 32-bit, multitasking computing power of SCO UNIX System V/386, designed to meet C2-level security
- compliance with POSIX™ and X/Open® standards
- an OSF/Motif™-based, Presentation Manager-compatible, graphical user interface
- distributed SQL database management services
- compatibility with existing DOS, XENIX®, and UNIX System applications and data files
- NFS™, TCP/IP, and LAN Manager networking facilities

And all at an unbelievably affordable price.

Discover the complete graphical operating system that leading companies worldwide are choosing as their development platform for the '90s—and using to turn their 386 and 486 PCs into instant workstations today.

Open Desktop from SCO.

OPEN DESKTOP®
The Complete Graphical Operating System

Call SCO today and ask for ext. 8408

SCO®
THE SANTA CRUZ OPERATION

(800) SCO-UNIX (726-8649) (408) 425-7222 FAX: (408) 458-4227 E-MAIL: . . .!uunet!sco!info info@sco.COM

SCO, the SCO logo, Open Desktop and the Open Desktop logo are registered trademarks of The Santa Cruz Operation, Inc., in the U.S.A. and other countries. UNIX is a registered trademark of UNIX System Laboratories, Inc. in the U.S.A. and other countries. POSIX is a trademark of The Institute of Electrical and Electronics Engineers. X/Open is a registered trademark of X/Open Company Ltd. OSF/Motif is a trademark of The Open System Foundation, Inc. XENIX is a registered trademark of Microsoft Corporation. NFS is a trademark of Sun Microsystems, Inc.
© 1991 The Santa Cruz Operation, Inc. All Rights Reserved. The Santa Cruz Operation, Inc., 400 Encinal Street, P.O. Box 1900, Santa Cruz, California 95061 USA The Santa Cruz Operation, Inc., Federal Systems Group, 2100 Reston Parkway, Suite 102, Reston, Virginia 22091 USA, (703) 715-8700, FAX: (703) 715-8750 SCO Canada, Inc., 130 Bloor Street West, 10th Floor, Toronto, Ontario M5S 1N5 Canada, (416) 922-1937, FAX: (416) 922-8397 The Santa Cruz Operation, Ltd., Croxley Centre, Hatters Lane, Watford WD1 8YN, Great Britain, +44 (0) 923 816344, FAX: +44 (0) 923 817781 TELEX: 917372 SCOLON G

2/91

CIRCLE NO. 84 ON INQUIRY CARD